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**Vol. I.**  
**TRANSCRIPT OF RECORD.**

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**SUPREME COURT OF THE UNITED STATES.**

**OCTOBER TERM, 1922 1923**

**No. 120**

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**THOMSON SPOT WELDER COMPANY, PETITIONER,**

**vs.**

**FORD MOTOR COMPANY.**

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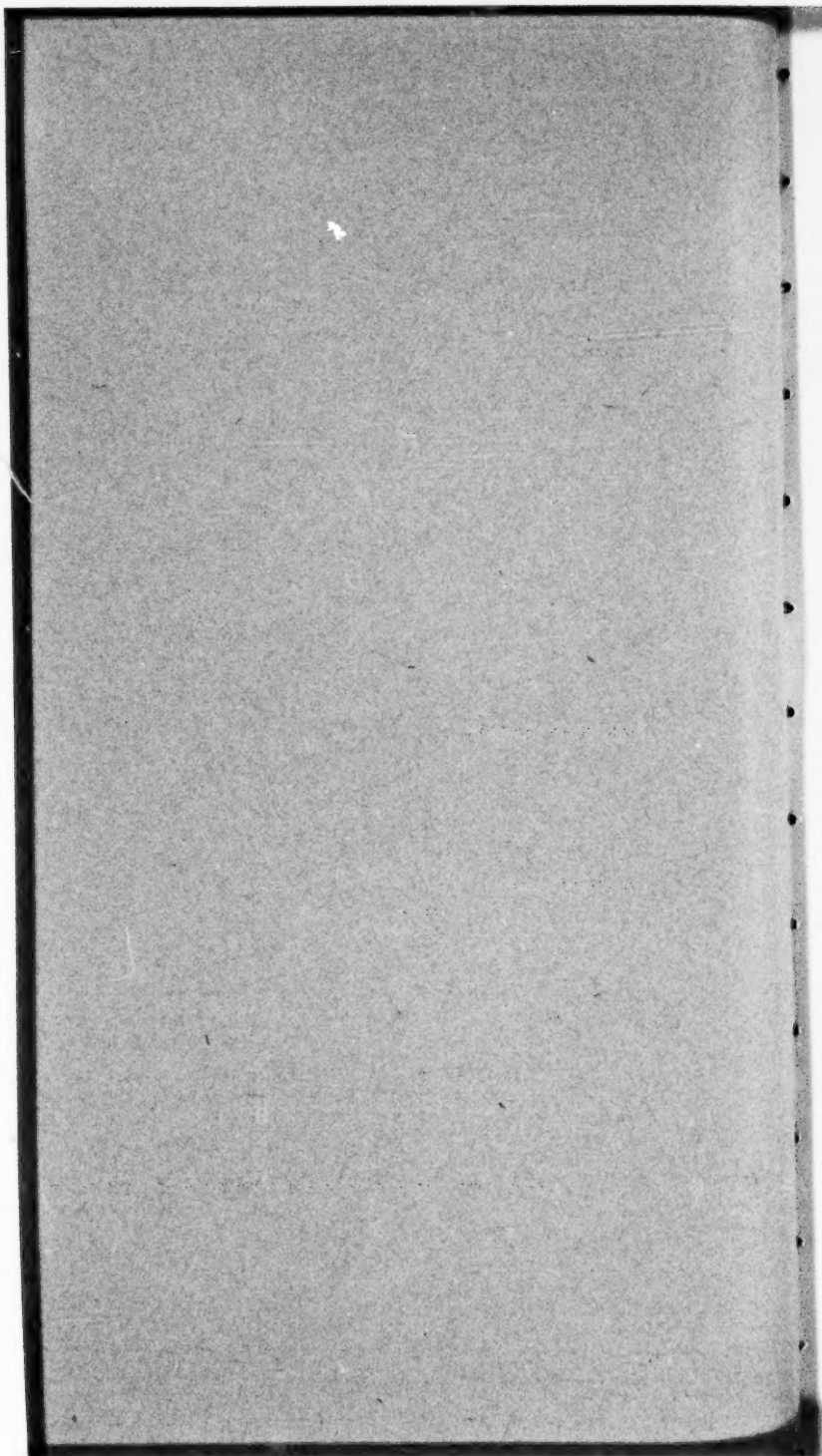
**ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT  
OF APPEALS FOR THE SIXTH CIRCUIT.**

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**PETITION FOR CERTIORARI FILED SEPTEMBER 12, 1922.**

**CERTIORARI AND RETURN FILED DECEMBER 12, 1922.**

**(29,139)**





(29,139)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1922.

No. 589.

THOMSON SPOT WELDER COMPANY, PETITIONER,

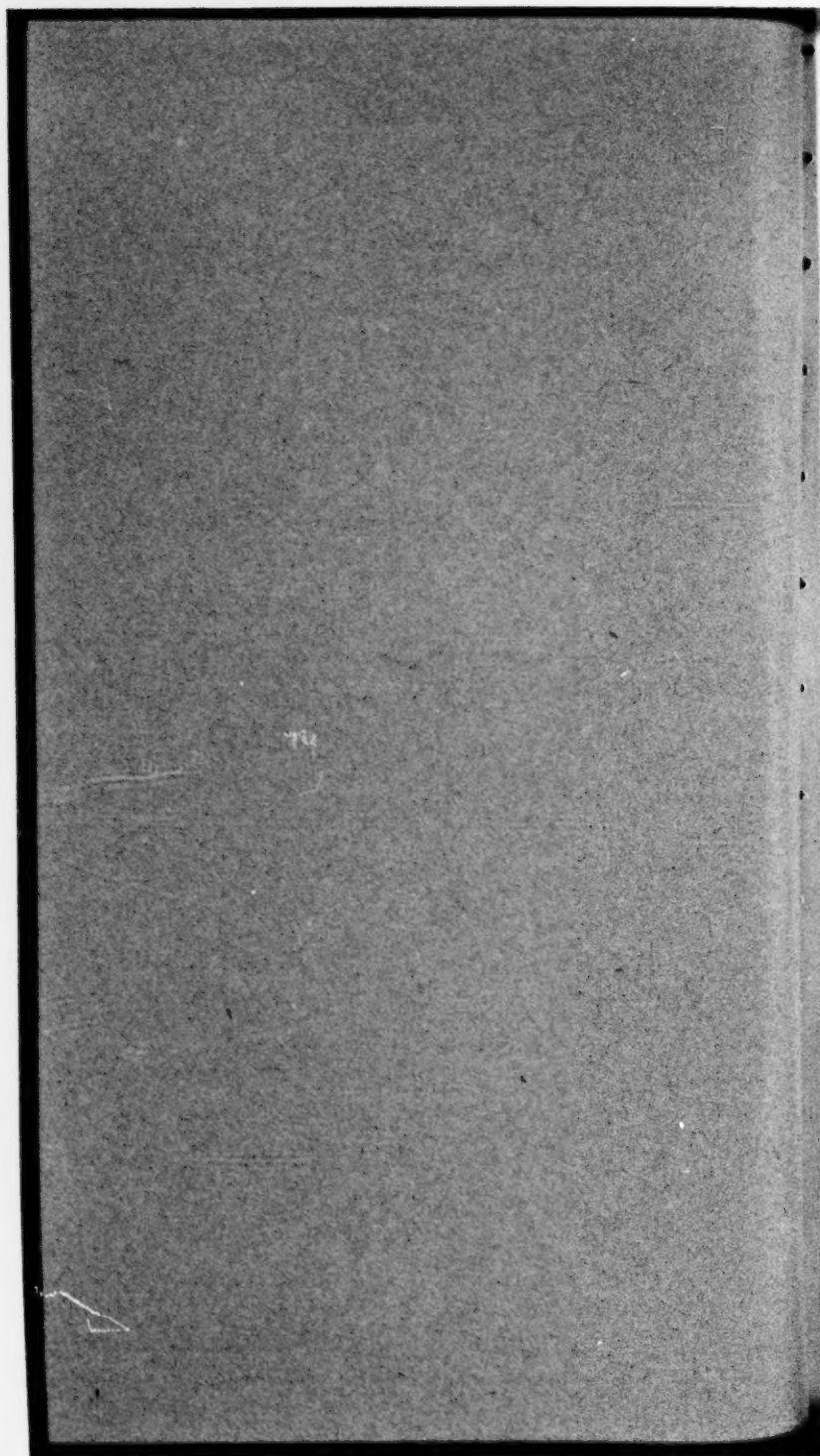
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FORD MOTOR COMPANY.

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Bill of Complaint.

1

1 In the District Court of the United States for the Eastern District of Michigan, Southern Division.

In Equity.

THOMSON SPOT WELDER COMPANY, Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

Harmatta Patent No. 1,046,066.

**Bill of Complaint.**

[Filed December 1, 1917.]

To the Honorable the Judges of the District Court in and for the Eastern District of Michigan, Southern Division:

Thompson Spot Welder Company, a corporation duly organized and existing under the laws of the Commonwealth of Massachusetts, and an inhabitant and a citizen of said Commonwealth and of the United States, brings this its bill of complaint against

2 Ford Motor Company, a corporation duly organized and existing under the laws of the State of Michigan, and a citizen thereof, having a regular and established place of business at Detroit, within said Eastern District of Michigan, where it has committed acts of infringement hereinafter set forth, and thereupon the plaintiff for its cause of action states:—

1. That this is a suit in equity arising under the Patent Laws of the United States.

2. That it is informed and believes, and therefore avers, that on or prior to the third day of December, 1903, Johann Harmatta, then residing at Szepesvaralja, Austria-Hungary, was the original, sole and first inventor of certain new and useful improvements in electric welding not known or used by others in this country before his invention thereof, and not patented or described in any printed publication in this or any foreign country before his invention thereof, or more than two years prior to his application for Letters Patent of the United States next hereinafter mentioned, and not in public use or on sale in this country for more than two years before his said application, and not abandoned by him prior to his said application, and not first patented, or caused to be patented, by him or his legal representatives or assigns in any foreign country upon application filed more than twelve months prior to the filing of his said application in this country, and that being such original, sole and first inventor the said Harmatta, on said third day of December, 1903, made application in due form of law to the

Commissioner of Patents of the United States for Letters Patent for his said invention and duly swore to the specification thereof, and by valid assignment in writing assigned his invention and application and any Letters Patent which might be issued for said invention to the Thomson Electric Welding Company, a corporation of Massachusetts and requested the Commissioner of Patents to issue to said company any Letters Patent which might be granted on his said invention; whereupon such proceedings were had that on the third day of December, 1912, Letters Patent of the United States numbered 1,046,066 were duly issued for said invention and on said application to said Thomson Electric Welding Company.

3. That the said Thomson Electric Welding Company, by certain instruments in writing, granted certain exclusive rights under said Letters Patent to the Universal Electric Welding Com-

3      pany, a corporation of New York, as in and by said instrument or duly certified copies thereof here in court to be produced will more fully appear, and that the said Thomson Electric Welding Company and said Universal Electric Welding Company have assigned all their right, title and interest in and to said Letters Patent No. 1,046,066 and all their rights to damages and profits for infringement of said Letters Patent to the plaintiff, Thomson Spot Welder Company, by instruments in writing, as in and by said instruments, or duly certified copies thereof here in court to be produced, will more fully appear, whereby the plaintiff, the Thomson Spot Welder Company, became and now is the owner of said Letters Patent and entitled to recover all damages and profits due to it or to its predecessors in title to said Letters Patent on account of any infringement of its or their rights under said Letters Patent.

4. That it is informed and believes, and therefore avers, that the defendant has been after the issuance of said Letters Patent, and before the commencement of this suit, and still is, within said Eastern District of Michigan, and elsewhere in the United States, without license or permission of the plaintiff, or of its said predecessors in title to said Letters Patent, and in infringement of said Letters Patent, practicing the method of electric welding embodying the invention claimed in said Letters Patent, and making metal work, plates, sheets and articles also embodying the invention claimed in said Letters Patent, without license or permission of the plaintiff, or of its said predecessors in title, and in infringement of said Letters Patent and to the plaintiff's great damage.

5. That the defendant had been duly notified of said Letters Patent, and of its infringement thereof, in violation of the plaintiff's rights thereunder.

6. That it is informed and believes, and therefore avers, that the said defendant is prepared and ready and threatens to continue said infringement, as aforesaid, and unless it is restrained from so doing, the plaintiff will suffer great and irreparable damage from said unlawful acts of said defendant, and said defendant has derived and received, and is still deriving and receiving, from said infringing acts great gains and profits.



7. That the said Thomson Electric Welding Company and Universal Electric Welding Company filed a bill of complaint against Barney & Berry, Inc., a corporation organized and existing under the laws of the Commonwealth of Massachusetts, on March 13, 1913, in the District Court of the United States for the District of Massachusetts, alleging infringement by said Barney & Berry, Inc., of the said Letters Patent, by practicing the method of said Letters Patent and by making and selling articles described and claimed in said Letters Patent; in said suit the defendant filed its answer on April 24, 1913, and a hearing on the merits was had in said District Court on April 1, 2, and 3, 1914; the District Court, on March 10, 1915, filed an opinion ordering that the bill of complaint be dismissed; the final decree dismissing the bill of complaint in said suit was entered in said District Court on March 24, 1915; the plaintiffs then took an appeal to the Circuit Court of Appeals for the First Circuit, which appeal was allowed by the District Court on March 26, 1915; the said Circuit Court of Appeals heard the argument on said appeal on April 29, 1915, and on October 5, 1915, handed down its opinion, a copy of which is hereto annexed, reversing the decree of the lower court and holding that said Har-matta patent was valid, and remanding the case to the District Court for further proceedings not inconsistent with its opinion; the mandate of said Circuit Court of Appeals was filed in the District Court on December 11, 1915; the plaintiffs, thereupon, on December 27, 1915, filed a motion for entry of a decree for an injunction, for an accounting for damages and profits and for costs; a hearing was had on said motion by said District Court on January 6, 1916; on January 25, 1916, a petition was filed in said Circuit Court of Appeals by the defendant, Barney & Berry, Inc., for leave to apply to the District Court for leave to amend its answer by including in the list of alleged anticipating patents the French patent No. 330,200, to Bouchayer, of March 13, 1903, and for leave to offer said patent in evidence, and to introduce proofs relating thereto, before the entry of a decree by the District Court; the Circuit Court of Appeals, on June 14, 1916, handed down its opinion, a copy of which is hereto annexed, denying the said petition of said defendant; the District Court, on July 11, 1916, handed down its opinion, a copy of which is hereto annexed, that the defendant has infringed the said Letters Patent No. 1,046,063, and stating that on motion the decree asked for by the plaintiffs would be entered; whereupon, upon motion of the plaintiffs, an interlocutory decree for an injunction, for an accounting for damages and profits, and for costs, a copy of which decree is hereto annexed, was entered by the District Court on July 17, 1916, and on the same day an injunction was served on the said defendant, Barney & Berry, Inc., restraining it from infringement of said Letters Patent, a copy of which injunction is hereto annexed.

Wherefore, plaintiff prays that an account be taken of the profits received by the defendant and the damages of the plaintiff and its predecessors in title to said Letters Patent in the premises; that the defendant, its clerks, officers, attorneys, agents, servants and work-

men may be perpetually enjoined and restrained by the decree and injunction of this court from directly or indirectly infringing said Letters Patent; that the defendant may be decreed to pay the costs of this suit and may be also enjoined and restrained as aforesaid during the pendency of this suit, and that the plaintiff may have such other and further relief as to this Honorable Court may seem meet. Thomson Spot Welder Company, by Daniel J. Lyne, Secretary. Fish, Richardson & Neave, F. P. Fish, J. L. Stackpole, Stevenson, Carpenter, Butzel & Backus, Solicitors and of Counsel for Plaintiffs.

6      COMMONWEALTH OF MASSACHUSETTS,  
County of —, ss:

On this nineteenth day of November, 1917, before me appeared Daniel J. Lyne and made oath that he is the secretary of the Thomson Spot Welder Company, the plaintiff named in the foregoing bill; that he has read the foregoing bill subscribed to by him and knows the contents thereof, and that the same is true of his own knowledge, except as to matters which are therein stated on information and belief, and as to those matters he believes them to be true. Stewart C. Woodworth, Notary Public. (Seal.)

7      (Referred to in and made part of this Bill of Complaint.)

United States Circuit Court of Appeals for the First Circuit, October Term, 1914.

No. 1115.

THOMSON ELECTRIC WELDING COMPANY et al., Complainants, Appellants,

v.

BARNEY AND BERRY, INCORPORATED, Defendant, Appellee.

Appeal from the District Court of the United States for the District of Massachusetts.

Before Putnam, Bingham, and Aldrich, JJ.

**Opinion of the Court.**

[Filed October 5, 1915.]

PUTNAM, J.: This case alleges infringement of a patent for an invention, and the decree in the District Court was for the respondent. Thereupon the complainants appealed to us. The opinion of the learned judge of the District Court refers to the fact that there were twenty-one claims in all, the first sixteen being for a method or

process, and the last five for the product. The opinion also states that the complainant asked the court to consider only eight of the process claims, Nos. 3 to 6, 8, 9, 11, 12, and only four of the product claims, Nos. 17, 18, 19 and 21.

The alleged defenses are lack of invention, anticipation, invalidity because of the changes made in the application before issue of the patent, and non-infringement. We need not distinguish the

8 defenses by taking them each up, separately and specifically, because the whole case turns mainly about a single major proposition.

The opinion of the learned judge of the District Court says that the introductory statements in the patentee's specifications are that the inventions relate to the manufacture of metal articles of all kinds, and consist of a novel method of fastening their component parts together by process of electric welding, and also of the new articles produced thereby. He also observes that the inventions are further said to afford a cheap and practical substitute for riveting.

The brief for the complainants, now the appellants, states substantially the complainant's case, as follows:

"Harmatta's invention of the patent in suit was a new departure in the art of electric welding, which art had been created by the inventions of Prof. Elihu Thomson in 1886, shown and described in the Thomson patents Nos. 347,140 and 347,141.

"These Thomson patents show and describe for the first time the process of electric welding, but disclose only how it may be applied to joining the butt ends of two metallic rods together by passing an electric current of low voltage and high amperage from one rod to the other. The invention was a valuable one and went into commercial use, where the process became known as 'butt welding.' In this Thomson butt-welding process two metal rods are held by large copper electrode clamps, which are respectively the terminals of the electric circuit. When the current is turned on, it flows in its circuit through the electrode clamps and through the ends of the rods which protrude beyond the electrodes. As the rods are of smaller cross-section than the electrodes, they restrict the flow of the current to the smaller path which they afford, and they thereby concentrate the current and increase its heating effect.

"The resistance of the rods, together with the resistance at the joint between their abutting ends, increases the heating effect of the current, so that the ends of the rods are highly heated by the current and become plastic. The resistance and resulting heat at the joint are comparatively great because of the break in the continuity of the metallic circuits, and the consequent obstruction to the flow of the current.

9 "When the ends have thus become plastic, the rods are pressed bodily toward one another, the metal spreads and unites, with the result that the ends of the rods are joined by a weld. At the point where the joint is, the extruded metal forms an annular ridge.

"The characteristics of this butt-welding process are that—

"(1) The current is concentrated by the rods themselves, the ends of which are being welded together;

"(2) The welding heat is caused by the resistance of the metal between the clamps and by the resistance of the joint at the ends of the rods;

"(3) The area of the weld is determined by the area of the work, i. e., the ends of the rods;

"(4) The metal is extruded around the joint;

"(5) As the rods are united, they approach one another bodily, so that allowance for this always must be made.

"The plaintiff was formed to develop this Thomson invention. It has been engaged in the business of making and leasing machines for performing this process of butt welding. It has also granted licenses, as, for example, to the other complainant, the Universal Company, which had a license for spot welding, in 1909, which refers to prior licenses for 'spot welding,' granted in 1904.

"These Thomson patents protected this business, for they covered broadly the process and product of electric welding, as Thomson's invention was a true pioneer invention, having created the art of electric welding.

"But the underlying Thomson patents disclose as his only specific application of his fundamental invention one which was of limited utility, namely, the electric welding of the butt ends of two rods. But until Harmatta's invention, by which for the first time in the art it was practical and feasible by the use of new principles of operation to unite two thin plane sheets of metal together by electric welding, at any spot or at several spots of their contacting surfaces, no practical application of Thomson's invention of electric welding was made beyond that of the butt welding originally disclosed by him in his patents of 1886, in spite of the efforts of himself and other inventors."

In order to make clear the state of the art, it was necessary to explain, as we have just done, the primary inventions covered  
10 by the patents of Elihu Thomson of 1886. These constitute the foundation of the whole are of electric welding, and the patent now in suit, as other secondary patents to which we may now refer, must be regarded as developments or branches of Thomson's original invention, and as merely subsidiary inventions or improvements. There have been other subsidiary inventions, as, for instance, the lap-roller process, invented also by Thomson, by which the method of uniting the overlapping edges of two sheets of metal by a lap weld was devised, and by virtue of which some other secondary inventions were made practicable; all of which may be regarded as growing out of the inventions of 1886, but all of which were in different fields from the spot-welding invention now under consideration, and were in no way subsidiary to it or incidental thereto, so that neither the one nor any of the others anticipated Harmatta's invention or were infringed by it or infringed it. Although all growing out of the same root, they were independent branches.

Consequently, we have only to consider further the following alleged defenses to the complainant's bill, namely:

That there is no patentable invention in welding separated spots;

That appellants' attempted distinctions are without basis;

That there was no distinction between roller electrodes covering the entire amount of the overlap, and Harmatta's process;

That Thomson's sheet patent No. 496,019 showed sheet metal united by soldering, and thus anticipated;

That it also showed electrodes having area less than the contracting area, as in Harmatta;

That the Thomson process is the same as Harmatta's, the difference being in the amount of pressure and current only, and that generally there was no showing of invention by Harmatta's patent;

That the appellee does not infringe,

And that Harmatta's patent is invalid by reason of changes since the original application.

Returning to the defenses based on the roller-electrode process, or other processes devised with reference to overlapping sheets, it is all too plain that neither in its practical operation nor in its result was there any resemblance to the spot welding such as to require discussion. It is quite plain that the attempts in that direction were too experimental to form the basis of any sound defense; indeed that defense and the proposition of accomplishing the work by soldering were each in an art so remote as to require no attention beyond these brief reference thereto. These observations apply to all those lines of defense which rest upon the attempt to compare the size of contact spaces or areas mathematically, because the spot welding has nothing in common with such attempts; and, furthermore, a study of all these special defenses going to the proposition that spot welding, as shown by Harmatta, was in any way anticipated, falls to pieces, because there was nothing in them indicating an element of commercial success, and in this art, which was special and practicable, the art for rapid and inexpensive or cheap product was the first element of success. It is enough to repeat what we have already said generally; that is, in all these defenses of anticipation there is nothing which includes practicable utility.

Apparently much reliance is placed upon the claim that the application for the patent, during the many years it was pending, had been essentially changed, and so lost its validity. It originally embraced not only spot welding, but line welding, and line welding was not abandoned until after the alleged infringers in this case had constructed the machine with which they were operating when the bill was filed. The patent was applied for on December 3, 1903, and was not issued until December 3, 1912; but the claim for spot welding was always in the application. The alleged infringing machines were first constructed in 1908; in 1910 the application covered both spot welding and line welding. It was then amended by striking out all claims for line welding; so, therefore, perhaps, no profits can be recovered for anything done prior to the amendment, and it is a question to be considered whether or not an injunction can go against

machines constructed before the amendment was made, or, if at all, then to what extent.

We have not been called upon to give consideration to any questions of this character, and the bill and briefs in support of the bill do not suggest any qualified decree in the matter whatever. The bill must, of course, be sustained, in view of the propositions we have already announced; and in view of the further proposition that the presumptions in favor of the patent are so far supported in this case by the insistency of the defense, and the comparatively enormous expense involved in maintaining it, we cannot question the present validity of the patent with reference to all propositions involved in the word "patentability." Nevertheless, the case is not put in such form as to enable us to go to a final judgment without further investigation. Indeed, it is not positively established what the proceedings of the respondents have been since the patent issued. The nearest that comes to it is the admission of the treasurer of the Barney & Berry Skate Works, the nominal respondents in this case, that the respondents had been using an infringing machine "before February, 1913," and "just before that time." There was also testimony of a witness for the complainant that he had seen the alleged infringing machines in operation on January 9, 1913, and that the ends of the electrodes on the machines were all about a quarter of an inch in diameter.

Under the circumstances, we can only enter a qualified judgment.

The decree of the District Court appealed from is reversed, and the case is remanded to that court for further proceedings not inconsistent with the opinion passed down on this fifth day of October, 1915; and the appellants recover their costs of appeal.

13 (Referred — in and made part of this Bill of Complaint.)

United States Circuit Court of Appeals for the First Circuit, October Term, 1915.

No. 1115.

THOMSON ELECTRIC WELDING COMPANY et al., Complainants, Appellants,

v.

BARNEY AND BERRY, INCORPORATED, Defendant, Appellee.

Application for Leave to Apply to District Court for Leave to Amend Answer.

Before Putnam, Bingham, and Aldrich, JJ.

### Opinion of the Court.

[Filed June 14, 1916.]

*Per Curiam:* We have carefully examined the Bouchayer French patent, No. 330,200, relied upon by the defendants, in their applica-



tion for leave to apply to the District Court to amend their answer, as an anticipation of the patent in suit, No. 1,046,066, issued to Harmatta, and are of the opinion that it is not material upon the question, or, at the least, that it does not present such clear and convincing proof as is calculated to bring about a different result from that reached in our opinion handed down in this case on the fifth day of October, 1915. It seems rather to present a device, the essential features, mode of operation and the result of which are entirely different from those disclosed in the Harmatta patent.

Application denied.

14 (Referred to in and made part of this Bill of Complaint.)

District Court of the United States, District of Massachusetts.

In Equity.

No. 701.

THOMSON ELECTRIC WELDING COMPANY et al.

v.

BARNEY AND BERRY, INCORPORATED.

On Entry of Decree after Mandate.

### Opinion.

[Filed July 11, 1916.]

DODGE, J.: The opinion of the Court of Appeals dated October 5, 1915, reversing the decree of this Court which held the patent in suit invalid, was followed by hearings in this Court in December, 1915, and January, 1916, upon draft decrees submitted by the respective parties for entry in pursuance of the directions given in said opinion. The defendant thereafter applied to the Court of Appeals for leave to amend its answer by setting up, as an anticipation of the patent in suit, a French patent to Bouchayer, which application was denied June 14, 1916.

The further proceedings in this Court in pursuance of the Court of Appeals decision on October 5, 1915, have been in substance as follows:

The plaintiff, submitting a draft decree adjudging the patent valid and providing in the usual terms for an injunction and accounting, stated that it had no further proof to offer and submitted that the facts of the infringement whereof it complained were shown by the record before the Appellate Court.

The defendant submitted two draft decrees; one dismissing the bill, the other, in the alternative, containing a proviso excepting from the operation of the injunction any machines, processes and products made or used before the amendment of the

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patentee's application before the issue of the patent made March 31, 1910.

The defendant thereupon offered to prove, and the plaintiff conceded, though objecting that the facts conceded were immaterial, that the witness produced by the Toledo Company, whose testimony appears in the record, testified as to certain machines used for spot welding in 1908 and 1909 and prior to March, 1910; that said machines were in fact used for spot welding; and that when so used they practiced the Harmatta method with the Harmatta result, under any construction as to them of the claims in suit.

The defendant then offered in evidence the French patent to Bouchayer, since brought by it before the Court of Appeals in its application denied June 14, 1916, as above stated. This was excluded, as was also a translation of the patent into English, objected to by the plaintiff as incorrect; and evidence offered by the defendant to prove that the translation was correct.

The defendant offered expert evidence to explain the operation of the machine described in the patent in suit and its process. This was also excluded.

The defendant then moved for leave to amend its answer so as to set up said Bouchayer patent as an anticipation of the patent in suit; which motion was denied, this Court not regarding the opinion of the Court of Appeals as permitting such an amendment at that stage of the proceedings.

The defendant then called Mr. Cutler, a witness who testified on its behalf at the original hearing, and he was permitted to testify, against the plaintiff's objection, that in heating the skates referred to in his former testimony, the operator held in his hand the bottom portion thereof, intended to lie against the sole of the wearer's shoe; that during the heating operation the portion so held did not become too hot to be held without burning; and that the skates were white nickel-plated before welding, whereby the welding operation was materially facilitated.

The defendant then offered in evidence three United States patents to L. S. Lachman, Nos. 896,218, 904,881 and 904,882, for the purpose of establishing the entry of other processes into the field prior to Harmatta's amendment of his application on March 31, 1910. These were excluded, the Court of Appeals opinion not being understood as permitting their introduction at that stage of the proceeding.

Nothing further was offered by either party.

The Court of Appeals opinion is understood to have settled the following matters for the purposes of the further proceedings therein ordered:

1. The process and product described in the patent in suit involve patentable invention.
2. They were not anticipated by anything in the prior art disclosed by the evidence.
3. Nor is the patent invalid by reason of any changes made before its issue in the original application for it.

4. Upon the evidence in the record, there has been at least some infringement by the defendant of the claims in suit. If, in the view of the Appellate Court, the briefs had failed to show any infringement, its opinion could not have declared, as it does, that the bill "must, of course, be sustained." Whether infringement had been proved or not, supposing the patent valid, was a question fully argued on the appeal upon such evidence as both parties had seen fit to introduce, as the record and briefs show; and as to a principal part of the alleged infringing manufacture, the opinion of this Court that it had not infringed the patent, even if valid, had been stated.

Dismissal of the bill on the ground, now asserted by the defendant, that no infringement had been proved, would therefore be a proceeding inconsistent with the Court of Appeals opinion; under which the further inquiry directed by this Court is to determine two questions only (1) whether or not the decree should be limited so as not to exclude from the profits recoverable under its profits "for anything done prior to the amendment" of the patentee's application in 1910; (2), whether from the injunction it is to contain there should be any exemption with respect to "machines constructed before the amendment was made," and what, if any.

The patent in suit was issued December 3, 1912. This bill was filed March 13, 1913. The patent is not for a machine, but for the described process of spot welding, and for the product thereby obtained.

17 Between the above two dates the defendant made articles like loom parts marked "Exhibits 8" and "9," and the skates marked "Exhibits 27," "28" and "32." In making such articles it used a machine which it had installed in May, 1911, and used ever since. This machine it bought of the Toledo Electric Welder Company, which, though not a nominal party, is defending this suit. All these facts seem to me established by the answers to the plaintiff's interrogatories in connection with the evidence in the record. There was no dispute as to any of them at the trial. The Court of Appeals opinion is not understood as deciding anything to the contrary.

No injunction is sought against the manufacture and sale of any machine, nor against the use of any, except to the extent that it may be used in following the patented process or in producing articles spot welded according to that process. The infringement alleged in the bill is "using a method of electric welding and making and selling metal work, plates and articles embodying the invention claimed in said Letters Patent." Against such infringement only is any injunction sought, or—in other words, against using the patented method or making the patent product, whether with the above or with any other machine.

The validity of the patent being now established, I am unable to doubt that loom parts like Exhibits 8 and 9 infringe the product claims in suit, or that in making them the defendant infringed the process claims in suit. Except as below stated the defendant is not understood to deny that said claims have been infringed by the manufacturer of said loom parts.

As to the skates, Exhibits 27, 28 and 32, the defendant contends that in making them there was no infringement either of the process or of the product claims, because the spot welds uniting their parts are not surrounded by unwelded areas, but are, on the contrary, continuous and overlapping so as to form practically continuous lines; and because they were made by the operator one after the other, each before its predecessor had time to cool, so as to form what is in effect a "line" as distinguished from a "spot" weld.

While the above may apply to a considerable proportion of the spot welds in these skates, it is not true of all; there are enough isolated spot welds to prevent the conclusion that the skates  
18 do not infringe even if the above contention could otherwise prevail. And, taking the facts as to the making of those spot welds in the skates which are so isolated from each other to be as the defendant claims, some at least of the claims in suit, such as claims 3, 8, 9, 11 and 12, seem to me incapable of a construction according to which spot welding so performed would not infringe them, consistently with the Court of Appeals opinion. I am obliged to agree with the plaintiff that the "line welding," referred to in that opinion, all claims for which are therein said to have been stricken out of Harmatta's application in 1910, is line welding of the kind effected by the bevelled roller electrodes described in Harmatta's original application, and is not that effected by making a line of overlapping, single spot welds.

The terms of the plaintiff's proposed decree, in connection with the pleadings, sufficiently show that no recovery of profits arising from any use of the patented process before the patent issued on December 3, 1912, nor for any articles produced before that date by said process is to be had. That no such recovery is sought has been expressly stated on the plaintiff's behalf. A recovery of profits "for anything done prior to the amendment of 1910, as suggested by the Court of Appeals in its question (1) above, is thus not to be apprehended from the entry of said decree.

As to the other question which the opinion directs to be considered, "whether or not an injunction can go against machines constructed before the amendment was made," the defendant has contended that the result of such consideration must be to prevent any injunction against its use of the Toledo machine above mentioned, or of any similar machine constructed before said amendment; and this was urged by it as requiring dismissal of the bill. With this contention, as has been stated, I am unable to agree.

There being no alleged infringing machines, strictly speaking, in the case, the Court of Appeals must be understood to mean, by its use of those words, machines like the defendant's, capable of infringing use in performing the patented process. The inquiry directed is therefore understood to be, whether there is evidence  
19 requiring the specific exemption from the terms of any injunction against the defendant of the use of any particular machine or machines. The only machine with whose use the proposed injunction will interfere, so far as now shown, is the defendant's machine installed, as stated, in May, 1911, and I do

not find evidence in the record sufficient to prove that this machine was constructed before March 31, 1910, the date of the amendment referred to. I do not understand the opinion as suggesting that the defendant may be left free to produce the patented product by the patented process upon other machines, in fact built before that date, if it can find them.

The draft decree submitted by the plaintiff is approved and may be entered upon motion to that effect.

(Referred to in and made part of this Bill of Complaint.)

### **Interlocutory Decree.**

[Filed July 17, 1916.]

DODGE, J.: This cause came on to be further heard upon the pleadings and proofs and upon the mandate of the Circuit Court of Appeals for the First Circuit, and counsel for the respective parties having been heard, now, upon consideration thereof, it is hereby ordered, adjudged and decreed that the Letters Patent of the United States referred to in the complainant's bill granted to the Thomson Electric Welding Company, as assignee of Johann Harmatta, No. 1,046,066, dated December 3, 1912, are good and valid; that said Johann Harmatta was the original and first inventor of the improvements described in said Letters Patent; that the complainant the Thomson Electric Welding Company is the true and lawful owner of said Letters Patent; that the complainant the Universal Electric Welding Company is a licensee under said Letters Patent; and that the defendant, Barney and Berry, Incorporated, has infringed claims 3, 4, 5, 6, 8, 9, 11, 12, 17, 18, 19 and 21 of said Letters Patent and upon the exclusive rights of the complainants under the same.

20 It is further ordered, adjudged and decreed that the complainants recover of the defendant the gains and profits which said defendant has derived, received or made by reason of its infringement of said claims of said Letters Patent, and that said complainants also recover any and all damages which they have sustained by reason of said infringement of said claims by the defendant; and this cause is hereby referred to — —, as a master of this court, to take and state an account of such gains and profits, and to assess such damages and to report thereon with all convenient speed. And the officers and employees of the defendant are hereby directed and required to attend before said master from time to time as required, and to produce before him such books, papers and documents as relate to the matters at issue, and to submit to such oral examination as the master may require.

It is further ordered, adjudged and decreed that a perpetual injunction be issued out of and under the seal of this Court against the said defendant, Barney and Berry, Incorporated, strictly enjoining and restraining it, its clerks, attorneys, agents, servants and workmen from directly or indirectly infringing said Letters Patent,

and from practicing the process of electric welding containing or embodying the invention described and patented in said Letters Patent and referred to in the claims thereof numbered 3, 4, 5, 6, 8, 9, 11 and 12, and from directly or indirectly making, constructing, using or selling metal articles containing or embodying the invention described and patented in said Letters Patent, and referred to in the claims thereof numbered 17, 18, 19 and 21.

It is further ordered, adjudged and decreed that the complainants recover of the defendants their costs of suit to be taxed. By the Court. John E. Gilman, Jr., Deputy Clerk.

21 District Court of the United States, District of Massachusetts.

I, William Nelson, Clerk of said Court, do hereby certify that the foregoing is a true copy of the Interlocutory Decree, entered July 17, 1916, in the cause entitled No. 701, Equity Docket, Thomson Electric Welding Co. et al. v. Barney and Berry, Inc., now pending in said Court.

In testimony whereof, I hereunto set my hand and affix the seal of said District Court, at Boston, in said District, this twenty-first day of July, A. D. 1916. William Nelson, Clerk. (Seal.)

22 (Referred to in and made part of this Bill of Complaint.)

### Writ of Injunction.

UNITED STATES OF AMERICA,  
*Massachusetts District, ss:*

The President of the United States of America to Barney and Berry, Incorporated, a corporation duly organized and existing under the laws of the Commonwealth of Massachusetts and a citizen thereof, having a regular and established place of business at Springfield, within said Commonwealth and District of Massachusetts, your agents and servants, Greeting:

Whereas, Thomson Electric Welding Company, a corporation duly organized and existing under the laws of the Commonwealth of Massachusetts, an inhabitant and citizen of said Commonwealth and of the United States, and Universal Electric Welding Company, a corporation duly organized and existing under the laws of the State of New York and an inhabitant and a citizen of said State and of the United States, have exhibited their Bill of Complaint before the Justices of our Circuit Court of the United States for the First Circuit, begun and holden at Boston, within and for the District of Massachusetts, on the first Tuesday of December, A. D. 1912, against you the said Barney and Berry, Incorporated, praying to be relieved touching the matters therein complained of, and whereas, by an order of said court, made on the seventeenth day of July, A. D. 1916, it was ordered that a writ of injunction issue under the Seal of the said Court, to restrain you and each and every



— of you, from doing all the matters and things from the doing of which you are prayed to be restrained in said Bill, according in full with the prayer of said Bill.

23 We therefore, in consideration thereof, enjoin and command you each, and every — of you that from and immediately after the receipt and notice of this our Writ by you, you, your clerks, attorneys, agents, servants and workmen shall not directly or indirectly infringe Letters Patent No. 1,046,066 and shall not practice the process of electric welding contained or embodied in the invention described and patented in said Letters Patent and referred to in the claims thereof numbered 3, 4, 5, 6, 8, 9, 11 and 12, and shall not directly or indirectly make, construct, use or sell metal articles containing or embodying the invention described and patented in said Letters Patent and referred to in the claims thereof numbered 17, 18, 19 and 21.

Whereof, you are not to fail on pain of ten thousand dollars, to be levied on your and each of your goods, chattels, lands and tenements, to our use.

Witness the Honorable James M. Morton, Jr., at Boston, the seventeenth day of July in the year of our Lord one thousand nine hundred and sixteen. William Nelson, Clerk.

A true copy. Attest: George A. Crockwell, Deputy U. S. Marshal.

UNITED STATES OF AMERICA,  
*Massachusetts District, ss:*

Springfield, July 17, 1916.

I hereby certify that I have notified the within-named respondent on the seventeenth day of July, A. D. 1916, at eight o'clock in the afternoon, by delivering in hand to Walter P. Dodge, its Treasurer, at Springfield, a true and attested copy of this Writ of Injunction. John J. Mitchell, U. S. Marshal, by Edward J. Leyden, Deputy.

Fee:

Service .....	\$2.00
Copy .....	.30
Expenses .....	.10
Telephone .....	.50
	<hr/>
	\$2.90

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### Amended Answer.

(Filed April 3rd, 1919.)

The Amended Answer of Ford Motor Company, Defendant to the Bill of Complaint of Thomson Spot Welder Company, Plaintiff.

This defendant answering says:

1. Defendant has no knowledge as to the citizenship and residence of the plaintiff, nor as to the incorporation of the plaintiff, as in the

bill of complaint alleged, and leaves plaintiff to make such proof thereof as it may be advised. Defendant admits that it is a corporation, created and existing under the laws of the State of Michigan, and that it is a citizen and inhabitant of said State. Defendant admits that this is a suit in Equity arising under the patent laws of the United States.

2. Defendant admits the issue of letters patent of the United States, No. 1,046,606, dated December 3, 1912, to Thomson Electric Welding Company, as the assignee of Johann Harmatta, but denies all the other allegations in Paragraph 2 of the bill of complaint, and leaves the plaintiff to make such proof thereof as it may be advised.

3. Defendant is not informed, save by the bill of complaint, whether or not the plaintiff has any such rights or interests as are set forth in Paragraph 3 of said bill and therefore denies all of the allegations of said Paragraph 3, and leaves the plaintiff to make such proof thereof as it may be advised.

4. Defendant denies that it has made, used or sold any articles covered by said letters patent No. 1,046,066 or that it has practiced the process set forth and claimed in said letters patent, in this judicial district or elsewhere, and denies that it has in any respect infringed said letters patent or any rights of the plaintiff therein, and denies that it has in any way damaged the plaintiff.

5. Defendants, upon information and belief, denies that the plaintiff has duly notified it of said letters patent No. 1,046,066, and of its infringement of the rights of the plaintiff thereunder, as in Paragraph 5 of the bill of complaint alleged.

25 6. Defendant denies that it has infringed, or is infringing, said letters patent No. 1,046,066, or that it is prepared and ready to infringe the same; denies that it has derived and received and is still deriving and receiving any gains or profits by reason of the infringement of said letters patent, or that it has in any way damaged the plaintiff by the infringement of said letters patent, or otherwise.

7. Defendant is not informed, save by the bill of complaint, as to the alleged proceedings set forth in Paragraphs 7 and 8 of the bill of complaint, and leaves the plaintiff to make such proof thereof as it may be advised; but defendant denies that it was a party or privy to any such litigation referred to in Paragraphs 7 and 8 of the bill of complaint, and denies that it is in any way bound or prejudiced thereby.

8. Defendant, further answering on information and belief, avers that the said letters patent No. 1,046,066 are invalid and void for the following reasons:

(a) Because the things patented in and by said letters patent No. 1,046,066, or substantial and material parts thereof claimed therein as new, had, long prior to the alleged invention and discovery thereof by the said Johann Harmatta, been patented or described or contained in letters patent of the United States and in letters patent of foreign countries, numbered and dated as follows, and granted to the following named patentees, viz.:

*United States Letters Patent.*

No.	Date.	Patentee.
347,140....	Aug. 10, 1886....	Elihu Thomson.
347,141....	Aug. 10, 1886....	Elihu Thomson.
363,320....	May 17, 1887....	Nicholas De Benardos and Stanislas Olezewski.
396,015....	Jan. 8, 1889....	Elihu Thomson.
432,727....	July 22, 1890....	Mark W. Dewey.
437,571....	Sept. 30, 1890....	Charles L. Coffin.
444,928....	Jan. 20, 1891....	Elihu Thomson.
466,266....	Dec. 29, 1891....	George W. Blanchard.
496,019....	Apr. 25, 1893....	Elihu Thomson.
531,197....	Dec. 18, 1894....	Hermann Lemp.
553,923....	Feb. 4, 1896....	Hermann Lemp.
26		
574,942....	Jan. 12, 1897....	William Robinson.
616,436....	Dec. 20, 1898....	Henry F. A. Kleinschmidt.
647,894....	Apr. 17, 1900....	George D. Burton.
670,808....	Mar. 26, 1901....	John C. Perry.
690,958....	Jan. 14, 1902....	Rudolph M. Hunter.
874,398....	Dec. 24, 1907....	Sebastian Ziani De Ferranti.
1,148,821....	July 27, 1915....	Sebastian Ziani De Ferranti.
928,701....	July 20, 1909....	Adolph F. Rietzel.

*French Letters Patent.*

No.	Date.	Patentee.
335,889....	Oct. 13, 1903....	W. Egel. (Delivered Dec. 21, 1903, Published Feb. 18, 1904.)
336,187....	Oct. 13, 1903....	W. Egel. (Delivered Jan. 7, 1904, Published Mar. 1, 1904.)

*British Letters Patent.*

No.	Date.	Patentee.
14,536....	July 25, 1894....	Charles F. Parkinson.
11,921....	May 25, 1903....	Sebastian Z. De Ferranti.
22,981....	Oct. 23, 1903....	Johann Harmatta.

*German Letters Patent.*

No.	Date.	Patentee.
50,909....	Feb. 19, 1890....	Nikolas von Benardos.

(b) Because the thing patented in and by said letters patent No. 1,046,066, or substantial and material parts thereof claimed therein as new, had, long prior to the alleged invention or discovery thereof by said Johann Harmatta, been shown and described in the following printed publications, viz.:

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*Publications.*

British Patent No. 11,921, May 25, 1903, to Sebastian Z. De Ferranti.

British Patent No. 14,536, July 25, 1894, to Charles F. Parkinson.

German Patent No. 50,909, Feb. 19, 1890, to Nikolas von Benardos.

(c) Because, prior to the alleged invention of the said improvements by the said Johann Harmatta, the same were invented by or known to and used by the following named persons or corporations at the following named places, to-wit:

Fred P. McBerty, of Warren, Ohio, at said Warren and elsewhere in the State of Ohio.

Central Oil & Gas Stove Co., of Gardner, Massachusetts, at said Gardner and elsewhere in the State of Massachusetts.

William Robinson, of Boston, Massachusetts, at said Boston and elsewhere in the State of Massachusetts, and at Brooklyn, New York, and elsewhere in the State of New York.

Elihu Thomson, of Lynn, Massachusetts, at said Lynn and elsewhere in the State of Massachusetts.

Adolph Rietzel, of Lynn, Massachusetts, at said Lynn, and elsewhere in the State of Massachusetts.

Thomson Electric Welding Company, of Lynn, Massachusetts, at said Lynn and elsewhere in the State of Massachusetts.

Sebastian Z. De Ferranti, of Hampstead, London, N. W., England, at said Hampstead and elsewhere in the Kingdom of Great Britain.

(d) Because, for more than two years prior to the application of the said Johann Harmatta for said letters patent No. 1,046,066, the said invention or improvements claimed in and covered by said letters patent were in public use and on sale in the United States, by the following named persons, or concerns, at the following named places, viz.:

Fred P. McBerty, of and at Warren, Ohio.

Warren Electric & Specialty Company, of and at Warren, Ohio.

28 Central Oil & Gas Stove Co., of and at Gardner, Massachusetts.

Elihu Thomson, of and at Lynn, Massachusetts.

Thomson Electric Welding Company, of and at Lynn, Massachusetts.

William Robinson, of and at Boston, Massachusetts, and at Brooklyn, New York.

Adolph Rietzel, of and at Lynn, Massachusetts.

(e) Because, the said Johann Harmatta was not the original, true and first inventor of the inventions or improvements set forth and claimed in said letters patent No. 1,046,066, but that said letters patent were surreptitiously and unjustly obtained for that which was in fact invented by another, to-wit, by Sebastian Z. De Ferranti, of Hampstead, London, N. W., England, who was using reasonable diligence in adapting and perfecting the same.

(f) Because, the subject matter set forth and claimed in said letters patent No. 1,046,066 was not set out in the application for said letters patent No. 1,046,066, as filed, as the invention of said Johann Harmatta and was not covered by the oath of said Johann Harmatta to said application, as required by the Statutes of the United States and the Rules of Practice of the United States Patent Office, made pursuant thereto, in such case made and provided, but such subject matter was inserted by amendment to said application, without the authority or sanction of said Harmatta, and without his oath as required by said Statutes and Rules.

(g) Because, of the abandonment to the public of the subject matter of said letters patent No. 1,046,066 by reason of the delay of the owner of the application for said letters patent to assert claim to such subject matter until more than a year after knowledge of the issue and publication of letters patent No. 928,701, granted July 20, 1909, to the predecessor in title of the plaintiff, Thomson Electric Welding Company, as the assignee of Adolph F. Rietzel; and defendant avers that the plaintiff is now estopped to assert the validity of said letters patent No. 1,046,066 as against the defendant or as against the public generally by reason of such delayed assertion of claim and such abandonment.

(h) Because, in view of the knowledge of persons skilled in the art at the date of the alleged invention of the said Harmatta, 29 the things attempted to be claimed and covered by said letters patent No. 1,046,066, did not embody or involve any substantial variation or change from said prior art, and did not involve the exercise of the inventive faculty or constitute patentable subject matter.

(i) Because, by reason of the representations and declarations made by the plaintiff or its predecessor in title to the Commissioner of Patents that Adolph F. Rietzel was the prior inventor over Johann Harmatta, the patentee of the Harmatta patent in suit, in respect of the subject matter of the said Harmatta patent, as shown by the record of the application for the Rietzel patent No. 928,701, and by the record of the proceedings in Patent Office Interference No. 31,792, between the said Rietzel patent and the application for the said Harmatta patent, the plaintiff is now estopped to deny the prior inventorship of the said Rietzel over said Harmatta and also to assert the validity of said Harmatta patent as against this defendant or any other member of the public.

9. Further answering, defendant is informed and believes, and therefore avers, that said letters patent No. 1,046,066 are now involved in an interference proceeding in the United States Patent Office with a pending application of the hereinabove mentioned Sebastian Ziani De Ferranti, which proceeding is known and designated as Interference No. 36,709, De Ferranti vs. Harmatta, and is pending and undetermined; that in said interference proceeding the said De Ferranti claims priority of invention over Harmatta in respect to the subject matter of said Harmatta patent No. 1,046,066; that defendant claims the benefit of all the rights of said De Ferranti in respect of said invention, application and interference proceeding, and of all the rights of said De

Ferranti under his aforesaid British letters patent No. 11,921, of May 25, 1903, and under his United States letters patent No. 874,398, of December 24, 1907, and No. 1,148,221, of July 27, 1915, and under Section 4887 of the Revised Statutes of the United States, and the International Convention, by virtue of a license from said De Ferranti to this defendant.

10. Further answering, defendant denies that the plaintiff is entitled to any injunction, provisional or permanent, or to any accounting or recovery, or other relief, or to any decree as  
 30 prayed for in the bill of complaint, and prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained. Ford Motor Company, by Barthel, Flanders & Barthel, its solicitors. Melville Church, of Counsel.

### Plaintiff's Interrogatories.

Harmatta Patent No. 1,046,066.

The following interrogatories are propounded by the plaintiff to be answered by Henry Ford of the Ford Motor Company, defendant, or such other officer of said defendant company, if any, who may have better or more complete knowledge concerning the matters inquired about.

Int. 1. Has the defendant at any time during the period from December 3, 1912, to the date of filing of the bill of complaint herein, used at its factory in Detroit, Michigan, one or more electric welding machines for electrically welding sheet metal articles, which machine or machines were purchased from the Winfield Electric Welding Machine Company prior to December 16, 1916?

Int. 2. Did said machines, or any of them, comprise a base portion having a horizontally-extending arm or bracket secured thereto in which was mounted one work-engaging electrode and having a second arm or bracket in which was mounted a second work-engaging electrode capable of being reciprocated towards the first electrode?

Int. 3. Did one or both of said electrodes have its tip or work-engaging end tapered?

Int. 4. Describe the electrodes used in said machines, and state their shape and dimensions.

Int. 5. Were said electrodes composed principally of copper?

31 Int. 6. Were the electrodes connected respectively to the terminals of a secondary circuit of an electric transformer?

Int. 7. During the period in question what was the means employed in said machines for moving one electrode toward and from the other electrode?

Int. 8. During the period in question was there an operating switch in the primary circuit of the transformer of each of said machines for controlling the supply of electric current to said electrodes?

Int. 9. Did the operator weld together with these machines, or any of them, two or more superimposed thicknesses of sheet metal,

constituting the work, by placing the work between the electrodes and then operating the machine to reciprocate the movable electrode to press the work between the ends of the electrodes and to pass the current through the two electrodes and the work at the place between the electrodes?

Int. 10. Did the passage of the current through the work and the pressure exerted by the electrodes result in welding the thicknesses of metal together at the locality or spot between the electrodes, but at no other place?

Int. 11. Did the operator, after obtaining the welding heat and pressure, operate the machine to cut off the current between the electrodes and to separate the electrodes?

Int. 12. During the period from December 3, 1912, to the date of filing the bill of complaint herein were the said machines, or any of them, operated at any time as described in the foregoing questions and answers in the welding together of two or more thicknesses of metal in the manufacture of automobiles and of parts thereof?

Int. 13. In the manufacture of automobiles and parts thereof was the operation of welding two or more thicknesses of metal together at particular places repeated a number of times with each article?

Int. 14. If your answer to Interrogatory 13 is in the affirmative, describe the position and number of such welds upon automobiles and parts so manufactured.

Int. 15. Were the welds, or any of them, made as described in the foregoing questions and answers separated from one another?

Int. 16. During the period from December 3, 1912, to the date of filing of the bill of complaint herein did the defendant  
32 sell automobiles or parts thereof in which two or more thicknesses of sheet metal were welded as described in the foregoing questions and answers?

Int. 17. Explain in detail the process or processes which the defendant has used at its factory in Detroit, Michigan, between December 3, 1912, and the date of filing of the bill of complaint herein to weld together electrically two or more superimposed thicknesses of sheet metal at a number of spots or places in their meeting surfaces, and state to what articles or parts of automobiles said process or processes were applied by the use of machines above referred to.

Int. 18. Has the defendant used at its factory in Detroit, Michigan, during the period in question a machine or machines substantially like that shown in the attached picture, Plaintiff's Exhibit No. 1; to weld together electrically two or more superimposed thicknesses of sheet metal at a number of spots or places in their meeting surfaces, and if not, how did the machines so used differ from that shown in this picture?

Int. 19. Attached hereto is Plaintiff's Exhibit No. 2; is this exhibit, so far as the welds are concerned, a fair example of a product produced by the defendant as a result of practicing the electric welding process described in the foregoing questions and answers,



or any of them, by means of a machine or machines described in such questions and answers.

The said Henry Ford, or other person answering these interrogatories, is required to answer each and every one of said interrogatories. Fish, Richardson & Neave, Stevenson, Carpenter, Butzel & Backus, Solicitors for Plaintiff.

It is hereby ordered that the foregoing interrogatories be answered, or good reasons be shown for not answering said interrogatories under and in accordance with the provisions of Equity Rule 58. Arthur J. Tuttle, U. S. District Judge.

Service of the foregoing interrogatories accepted this twenty-second day of January, 1918. Barthel, Flanders & Barthel, Solicitors for Defendant.

33

**Plaintiff's Exhibit No. 1.**

(Here follows Plaintiff's Exhibit No. 1, marked page 33.)

**34 Defendant's Answers to Plaintiff's Interrogatories.**

District Court of the United States, Eastern District of Michigan,  
Southern Division.

In Equity.

FRANK L. KLINGENSMITH, vice-president and treasurer of the Ford Motor Company, defendant, makes answer to the interrogatories propounded by the plaintiff, as follows:

Ans. to Int. No. 1. Yes.

Ans. to Int. No. 2. All machines used are designed in this manner.

Ans. to Int. No. 3. Yes.

Ans. to Int. No. 4. The electrodes on Winfield welders in use at the Ford plant are approximately 1 inch through at the base and 3 inches in length. In some cases they taper from the base, have truncated cone tops. In other cases the electrodes are cylindrical with or without truncated cone tops. These electrodes differ in shape and dimensions for various machines.

Ans. to Int. No. 5. Yes.

Ans. to Int. No. 6. Yes.

Ans. to Int. No. 7. By means of a lever operated by a foot treadle.

Ans. to Int. No. 8. Yes.

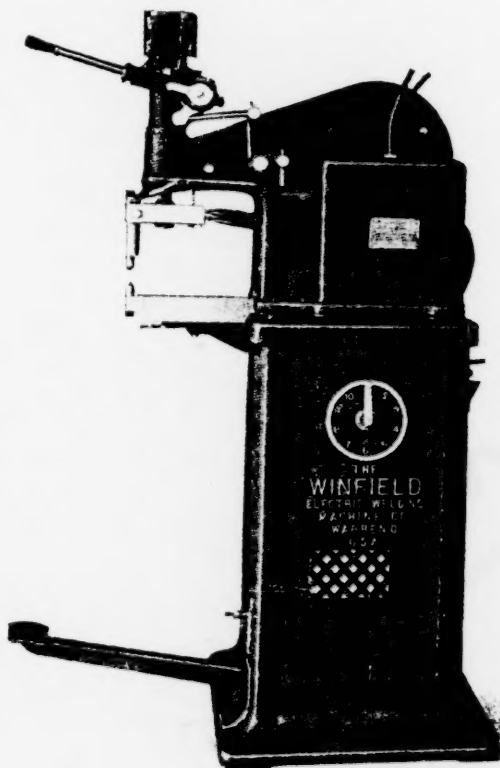
Ans. to Int. No. 9. Yes.

Ans. to Int. No. 10. This is a matter of opinion. The metal is apparently welded together over some portion of the area between the electrodes. Whether there is any welding beyond that locality I do not venture an opinion.



33

PLAINTIFF'S EXHIBIT No. 1.





Ans. to Int. No. 11. The current is cut off automatically when the operator removes his feet from the foot pedal. This action allows the upper electrode to return to its normal position.

Ans. to Int. No. 12. Yes.

Ans. to Int. No. 13. Yes.

35      Ans. to Int. No. 14. The number of such welds varies from one to a dozen or more.

Ans. to Int. No. 15. Yes.

Ans. to Int. No. 16. Yes.

Ans. to Int. No. 17. All of such welding is done on Winfield electric welders, the action of which has been described in the foregoing answers; and the parts of automobiles to which the process has been applied embraces mufflers, radiators, fenders, bodies and other parts.

Ans. to No. 18. Machines used are substantially like that shown in Exhibit No. 1.

Ans. to Int. No. 19. Yes.

Dated, February 5, 1918. Frank L. Klingensmith, Vice-President and Treasurer.

STATE OF MICHIGAN,  
*County of Wayne, ss:*

Frank L. Klingensmith, being duly sworn, deposes and says that he is the vice-president and treasurer of Ford Motor Company, the defendants in the above-entitled cause; that the foregoing answers to interrogatories made and subscribed to by him he verily believes to be true. Frank L. Klingensmith.

Subscribed and sworn to before me this seventh day of February, A. D. 1918. Herbert E. Hartman, Notary Public, Wayne County, Michigan.

36

### **Stipulation as to Copies of Patents Taking of Depositions and Civil.**

It is hereby stipulated and agreed by and between counsel for the respective parties hereto, subject to the approval of the court, as follows:

I. That the usual printed Patent Office copies of United States and foreign patents may be offered and received in evidence with the same force and effect as the originals or duly certified copies thereof, subject, however, to corrections by comparison with such originals or certified copies; and that the date of application printed upon any such copy of patent shall be prima facie evidence of the date of the application for such patent.

II. That either party may take the depositions of witnesses (including experts whose testimony shall be directed to matters of opinion) under the provisions of Sections 863 et seq. of the Revised Statutes of the United States; those taken by the plaintiff in support of its prima facie case to be taken within thirty days of

the date hereof; those of the defendant within sixty days after the closing of plaintiff's prima facie case, and those of the plaintiff in rebuttal within thirty days after the closing of the depositions so taken in behalf of the defendant.

III. That the court be requested to fix a day for trial to enable any witnesses that either party may desire to be called to be examined in open court in July, 1918, or at such earlier time as the business of the court may permit. J. L. Stackpole, Counsel for Plaintiff. Melville Church, Counsel for Defendant. Boston, Massachusetts, February 20, 1918.

37

**Stipulation.**

It is stipulated and agreed that the plaintiff's interrogatories and the defendant's answers thereto, already filed, may be received in evidence with the same force and effect as if the questions and answers had been made and given by a duly taken deposition. J. L. Stackpole, Counsel for Plaintiff. Melville Church, Counsel for Defendant.

**Stipulation Substituting Amended Answer for Original Answer.**

(Filed April 3rd (1919.)

It is hereby stipulated and agreed by and between counsel for the respective parties hereto that the accompanying amended answer of the defendant may be filed as a substitute for the defendant's original answer and that an order to this effect may be entered without further notice. J. L. Stackpole, Counsel for Plaintiff. Melville Church, Counsel for Defendant. Barthel, Flanders & Barthel, Solicitors for Defendant. Stevenson, Carpenter, Butzel & Backus, Solicitors for Plaintiff.

38

**Memorandum Opinion.**

(Filed Oct. 5, 1920.)

KILLITS, J.: This is an action for infringement of United States Patent No. 1,046,066, allowed December 3, 1912, to the plaintiff's predecessor in title, as assignee, upon an application filed December 3, 1903, by Johann Harmatta. The patent is one for improvements in electric welding and has sixteen claims for process and five for product. The specific character of welding involved is that known as spot-welding. The complaint alleges that all claims are infringed. Counsel for plaintiff treat and build their argument upon three claims as typical, namely:

"3. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immedi-

ately opposed surfaces so as to limit the union of the pieces to a spot or spots.

8. The method of electrically welding two plates or sheets of metal together face to face between electrodes, consisting in restricting the area of contact of an electrode with said plates to a spot, passing a heating electric current from said electrode to the co-operating electrode through said spot to heat the work to welding temperature and applying pressure to the work in line with said spot to effect a welding of one plate to the other.

17. Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas."

39 The defendant does not actively question title nor the truth of the more or less formal allegations of the complaint. The special defenses which we deem important are:

(a) Anticipation in the prior art, citing patents and publications which are hereafter discussed in some degree;

(b) Reduction to successful use prior to Harmatta's crucial dates by parties named, those particularly depended upon being F. B. McBerty at Warren, Ohio, and Adolf Rietzel, at Lynn, Massachusetts;

(c) The subject-matter, as finally set forth and claimed in the grant, was not set out in the application and was not subsequently entered under cover of an oath of the inventor in the process of amendment;

(d) Lack of substantial variation from prior uses and publications, and hence lack of invention;

(e) Plaintiff, by the declarations and representations first made in its behalf, as assignee of United States Patent 928,701 to Adolf Rietzel, issued July 20, 1909, upon an application filed February 24, 1905, and thereafter in interference proceedings between the Rietzel grant and the Harmatta application, is estopped to deny that Harmatta was effectively anticipated by Rietzel, and may not, therefore, assert the validity of the patent in suit.

The patent before us was adjudicated in 1915 at the suit of The Thomson Electric Welding Company (predecessor and privy in title to the plaintiff here) against Barney & Berry by a decision in the First Circuit Court of Appeals, opinion by Judge Putnam (227 Fed. Rep. 428).

There is substantial identity between The Thomson Electric Welding Company and plaintiff, wherefore, for brevity, we will hereafter refer to each as the Thomson Company in discussing transactions to which either was a party. Some of the questions in this case were determined in the adjudication referred to, but not all. Important references are not the same in the two actions, and the prior uses now

40 alleged and specially depended upon here were not set up in the other case; besides present defenses, as indicated above as (c), (d) and (e), are new. We have the record of the old case before us as part of this case.

The District Court in the former case (Circuit Judge Dodge sitting) found no patentability in Sarmatta. It is regretted that the opinion of the Circuit Court of Appeals reversing him is so drafted that it is not helpful in elucidating the solution which it attempts. It is little more, in fact, than a formal reversal of Judge Dodge, who analyzed the prior art in finding anticipation. The Circuit Court of Appeals does not attempt to meet the reasoning of the District Court. Giving the opinion, however, all due respect, we still feel at liberty, in light of our larger and different record, to review the questions which the court in the First Circuit has decided.

The application of Harmatta had many vicissitudes. It was filed December 3, 1903, and granted December 3, 1912. The specifications, as they finally appeared, are so different from those offered at the outset that it is a matter of close analysis to trace their genealogy to the latter. Eight times was the application rejected after original and amendments were under scrutiny of three different examiners. The allowing examiner (the fourth one in charge) finally passed the case, as it then stood, to an allowance with evident reluctance, venturing the opinion that certain citations anticipated many of the claims. He (Examiner Rich) concludes in his allowance as follows:

"Inasmuch as the claims of this case have previously been considered allowable and those noted above have been contested in an interference with a patent wherein similar claims were granted, a formal rejection is not now made, since upon consideration and explanation it may appear that the references cited have been formally or informally considered in the examining division earlier having jurisdiction of the applications and held not pertinent. It is thought best, however, to note them in order that if the claims do differ from the patents, such differentiation may appear in the record."

41 February 9, 1909, the third examiner (Shaw), after the eighth rejection of the application, made this suggestion:

"It is thought that if there is any patentable matter in this case it resides in the securing of the sheet metal parts together by means of the small round, sharply defined place of welding which answers the purpose of a rivet, as is set forth on page 6 of the original specification."

The original specification was cancelled May 9, 1904, and the specification and claims had been repeatedly amended and twice entirely re-written before 1909, each time excluding that in the original which Examiner Shaw qualifiedly approved. At no time prior to the latter's suggestion, not even in the original specification, was any claim made for patentability upon this specific idea, but January 27, 1910, more than eleven months after the hint came from the examiner, two claims, attempting to specifically cover it, were offered by way of amendment. They were rejected March 22, 1910, by Examiner Shaw. In the meantime the Rietzel patent

(928,701) had been allowed. The examiner suggested that, in accordance with Rule 96 of the Patent Office, applicant adopt Rietzell's claims for the purpose of interference, directing attention to the rule that unless that were done, the application would be finally rejected as covering nothing new. Harmatta's counsel followed the suggestion, taking altogether eleven claims from Rietzel, and interference proceedings were begun with a declaration dated April 26, 1910.

Final allowance to the Thomson Company, as assignee of Harmatta, resulted after the close of the interference in 1912, but under circumstances which not only take away most of the force of the presumption of invention and patentability which otherwise would follow allowance, but give opportunity to reflections upon the good faith of plaintiff itself in its dealings with the Patent Office. We discuss this matter at length hereafter. We think the presumption in question gets all the honor due it in this case if we do no more than to keep in mind that it exists.

42 Something analogous in suggestive flavor attends the situation which finally developed in and from the litigation in Boston which adjudicated for the First Circuit. The record shows that counsel for defense in that case prepared their work ably in their briefs against the validity of the patent. They are exhaustive and persuasive, but the presentation was lamentably lacking in the offering of known facts. Thus, while the McBerty alleged prior use, which figures so largely and importantly in this case, was known, it was neither pleaded nor vigorously offered. Likewise the Rietzel matter was ignored, although the losing counsel had also lately defended another client in a suit by the Thomson Company brought on the Rietzel patent. Even if it be a fact that our views respecting the effect of the McBerty and Rietzel matters are in each instance unsound, it must be admitted that each is at least so significant in scope and application as to justify and very loudly suggest offering it to the court in a vigorous defense to a patent in which it is in seeming collision. After the adjudication in the case in Boston terminated, the successful litigant bought out its rival and gave the latter's responsible head, who, under his counsel, managed the defense, a most advantageous connection with the exploitation of the Harmatta process. This court does not permit itself to adjudge, to any extent, anything sinister in these matters, but, because of them, we not only find special occasion for regret that Judge Putnam did not write an opinion in reversing Judge Dodge's conclusions which met the latter's reasoning in some detail at least, but there is an additional strong call for extreme care in this court, although the importance of the issue is itself so great as to demand our very best attention.

Passing upon the defenses, we may discuss together those designated above as (a) and (d) dealing with patentability in 1903 because of the then state of the art and prior uses. The file wrapper indicates a very unanimous opinion by the patent office examiners that Harmatta was treading a path barely, if at all, distinguishable



from that marked out in the art, and their individual and independent judgments, as the case passed the years of its pendency by, seem confirmed by acquiescences in the repeated rejections. The record justifies Judge Dodge's observations (227 Fed. 428, 432) "that only with unusual difficulty was Harmatta able to suggest, or the Patent Office to find, in his spot-welding process, how-  
43 ever described, anything capable of being regarded as patentably new in view of the prior art."

After careful consideration of the record, giving full respect to the unanalytical opinion of the Court of Appeals of the First Circuit in the Barney & Berry case, the mind of this court concurs with that of Judge Dodge that the disclosures of the prior art were so illuminating that patentability did not rest in the Harmatta process even as it was developed by the aid of Examiner Shaw after it had been in the office for more than six years. In our judgment, a question, the solution of which determines the issues here, abides in this record of greater scope than that of mere patentability of this process, but that counsel may know the trend of this court's thought respecting them, we will consider as briefly as possible the matters of patentability and invention. Counsel for plaintiff state the alleged novelty and advantage of the invention in these words:

"Harmatta for the first time in the art devised an electric welding process having the following characteristics and novel principles of operation:

(1) The current is concentrated solely by the electrodes, and not by the articles being welded;

(2) The metal, heated for welding, is entirely surrounded by comparatively cold metal;

(3) The area of the weld is determined by the size of the ends of the electrodes, and not by the extent of the overlap of the articles being welded;

(4) There is and can be no extruded metal and

(5) The parts are united in situ, as they are not caused to approach one another bodily during the process."

In our judgment, particular idea 1, as counsel designates it, is clearly exhibited in the Thomson patent No. 444,928 (where Judge Dodge found it also), in Lemp 553,923, as well as in Thomson's 496,019, which, although called for electric soldering, is evidently important here for its disclosure effect, as the Patent Office itself recognized. All three of these patents, since their inception as applications, have been owned by plaintiff. The specification in Thomson's 444,928 states that,

"the frames F F', being of conducting material, may be connected with any suitable source of electric current of large volume  
44 through cables C C', or by other means, so that an electric current may be caused to pass from one roll to the other, and through any pieces of conducting material held between them in pressure-contact."

It is obvious that this current is concentrated and applied from the faces of the rolls R R' held in the frames F F'. We think that

counsel for defendant in this case were fully justified in saying that the purpose of the invention of this patent is "to unite plane sheets of metal, face to face, by pressure and an electric welding current applied to the sheets to be united, the pressure being applied to the work through the electrodes that feed the current to the work, and the welds being formed between the contacting faces of the work at the point of pressure, only." Lemp so understood this Thomson invention as evidenced by that language of his specification which speaks of the prior art, and he adopts the same device where he wishes to employ pressure at the time the current is applied, for he says that he uses rolls as terminals when he wishes to apply the welding or forming pressure in connection with the current. See lines 64 to 69, page 2, Lemp 553,923, describing the operation of the device indicated by Fig. 3. In Thomson's electric soldering patent No. 496,019, the "pressure pieces" C C' of Fig. 6 perform the same office. Burton says in his specification to his patent No. 647,694:

"In the use of this apparatus the pieces to be lapwelded are adjusted or placed with their ends overlapping on the bed-electrode 100. Then the foot-lever is depressed, and one of the electrodes of the electrode-head is brought into contact with the work, whereby the circuit is closed and the current passes through the work in transverse direction across the overlapping ends of the parts to be heated."

Of course lap-welding is a form of flat welding. Any plates that can be lap-welded may be generally flat welded by adaptation of the jaws holding the electrodes to permit the insertion, to a necessary degree, of the metal to be worked upon, that is to say, it is a mere matter of slipping the two sheets to be united further along over their flat surfaces then is necessary for mere lap-welding.

Harmatta's device, for instance, is suitable either for lap-welding, 45 or for work more extended within the limits of the boundaries of the pieces worked upon, and the converse is true with mere lap-welding machines if the jaws are sufficiently modified to meet the demands of the work. Harmatta's original specification was for lap-welding. In his concluding paragraph therein is this suggestion by way of illustrating what he is working upon: "If then two superposed sheet metal ends to be welded together are introduced, etc." In Parkinson (English, 1894, No. 14,536) by Fig. 3, and in Bernados (German, 1890, No. 50,909) by Fig. 2, devices having the same function are shown. In the American translation in evidence, Bernados says:

"This process may serve to directly weld together relatively thin metal sheets and rods, of one and the same or of different metals: \* \* \* This process is clearly distinguished, both from the point of view of the inventive idea on which it is based and from that of its mode of operation, from \* \* \* the electric welding process of Elihu Thomson."

The idea is, we think, also very plainly in the Perry patent, No. 670,808. Other references are in evidence which defendant's counsel in-

sist have a bearing here. Some of them will be discussed later in another connection. Enough, we think, is offered above to indicate lack of novelty in this first characteristic.

Going now to particular 2, that "the metal heated for welding is entirely surrounded by comparative cold metal," leaving a condition of "spot" welding, what do we find? Obviously, that the result is determined by the shape and character of the application of the current-concentrating electrodes. If these are roller forms and applied by rolling as in Thomson No. 444,928, and in Lemp and in Harmatta's discarded roller specification, the welded strips would be bounded on the sides only by comparatively cold metal. If roller electrodes are applied with either intermittent pressure or intermittent current, or if pin electrodes are used, of course there will be an entire surrounding of the weld by cold metal. Indeed, the idea that spot-welding may be done with roller electrodes is present in both the Thomson 444,928 and the original Harmatta specifications. In the former,

46 after directing that the plates, being between the rolls, should be squeezed together to form an electric contact, is said (p. 1, lines 88, et seq.):

"The electric current being now turned on as it passes from one roller to the other and across the point of pressure will heat the work to the welding temperature and soften the same slightly, after which the screw may be given a few more turns to effect a solid union. The work, having been thus started, may now be moved along through or between the rollers so as to bring successive parts of the joint into position to be pressed and heated in the same operation."

Harmatta says (file wrapper, p. 3, 2nd paragraph):

"The pressure being exerted by roller electrodes, whereby the advancing series of single points \* \* \* is united to a whole, etc."

In Thomson 496,019, undoubtedly the result effected in plate P, at least, of Figs. 4, 5 and 6 is to leave surrounding the welded portion an area of cold metal. Also it seems clear that the flanges of the part (to be welded) designated as P' would be only incidentally and slightly heated in the process, merely because of their adjacence to the "pressure piece" C'. In Thomson's riveting patent 396,015, the same thing is shown. There the so-called plunger and anvil, G and E', really are the termini of electrodes, performing upon the material of the plates to be riveted, after the particular rivet is swaged and set, the same function, except in annular result rather than as a filled spot, which they obviously would accomplish if the applicable ends of each were flat and not concave and were used in plain spot-welding. Thomson says that if the current is allowed to pass under pressure longer than is merely necessary to swage and set the rivet, "the application of pressure to the pieces to be riveted will weld them together around the rivet." Plainly this would be the work of whatever circumferential surface there is to the concave-faced electrodes and just as manifestly these riveted places, surrounded by a ring of welding, would be further surrounded by areas of cold metal. When we contemplate the unequivocal form of this statement, and know that the

result which it plainly suggests, will follow, it is to be marveled at that Thomson, in endeavoring to assist the Thomson Company  
47 to obtain a patent on Rietzel's application and in speaking of this patent of his (No. 396,015) should say that (see file wrapper, Rietzel No. 928,701),

"the only possible welding that could be produced by that process would be possibly some sticking of the edge of the perforation in the metal sheet to the side of the rivet which is a mere incident of the invention and there is no welding of the superposed plane surfaces or opposed faces of the plates to one another by welds disposed over such plane faces."

Notwithstanding this statement from such eminent authority, it seems to us that we are clearly given to know that there would result from the process of Thomson 396,015 an annular welding together of the plane surfaces of the riveted plates beyond the rivet, the breadth of the welded surface within the circumference to be determined by the amount of annular plane surface on the faces of the electrodes which are concave at their centers. Besides, it seems that a deduction from the roller method is obvious that the question whether the weld shall be partially or wholly surrounded by cold metal depends either on the shape of the electrodes or on the size of the flat surfaces to be welded, or on the extent or manner in which the electrodes are applied to the face of the material to be worked on. For instance, if roller electrodes are first applied within the boundaries of the plates and stopped before any edge is reached, the result would be an elongated spot weld. So also would be the result if the plates operated upon in Thomson's 444,928 had dimensions greater than the working face of his segment electrodes (Fig. 2). It is obvious, as noted above, that if roller or segment electrodes are simply applied to the plates with current and pressure, but not rolled, a spot weld would result. The importance in Harmatta's field of the Kleinschmidt patent (No. 616,436) issued in 1898, was recognized by him in his final specification in which is disclaimed any feature disclosed by the Kleinschmidt grant. Whatever else may be said of the latter, it can not be doubted that its welds are surrounded by areas of cold metal. Harmatta himself seems not to have considered, in his original application, the advantage of this particular (2) as an element of his  
48 invention. What he then thought he was inventing was, to use his language, a process which consisted,

"In one of the electrodes (or both of them) not only serving to feed the current, but also being employed for exercising a more or less strong pressure either before and during the period of supplying the electric current, or only at the moment of this supply, at the place at which the welding is to be done. The member which feeds the electricity is thus at the same time the tool, and in this manner the most favorable conditions of working possible are secured, since, as is well known, in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough."

His only process claim in the original application was in this language:

"1. The process of electric welding, consisting in employing the electrodes not only to conduct the current to the objects being welded, but also to exert a regulable pressure on the same, substantially as described."

His remaining three were for apparatus. He treated spot or intermittent welding as if it were obviously, as it seems to us it is, but a variety of result, depending upon the choice of the operator. He illustrates two forms of apparatus for its accomplishment and speaking of one of them says:

"Thus, if it is required to weld, for instance, sheets of metal only at particular places, the apparatus shown in Fig. 5 may be advantageously employed, the electrodes *a, b*, having the form of pins. \* \* \* If then two superposed sheet metal ends to be welded together are introduced between the electrodes, and the latter then firmly pressed together and the circuit closed, a small round, very sharply defined place of welding is caused which perfectly answers the purposes of a rivet."

All this part of his specification he omitted in seven successive amendments and modifications, until January 27, 1910, more than six years after his filing date, his counsel observes the hint of an  
49 examiner made eleven months before, and, then, for the first time, claimed this feature as the essence of his invention.

Should a patent have been allowed Harmatta on the original application, it cannot be said that he would have been protected against spot-welding accomplished by any method not covered by his apparatus claims and without the limits of his process claims. Gate Lock Company vs. Greenleaf, 117 U. S. 554, 559.

It is plain that Harmatta applied in the first instance in ignorance of the state of the art. The original specification contains the clause quoted below and upon the erroneous conception, therein indicated, that the field was wide open, he predicated his alleged invention.

"According to none of the present known electric welding processes are the articles to be welded firmly pressed together during the welding operation by one or both electrodes, for the purpose of favoring welding. Hitherto either no pressure has been exerted at all, or it has been exercised at a certain distance from the place of welding, or at all events not centrally direct upon the electrodes pressing on the place to be heated. In short, hitherto direct electric welding pressure has never been exercised, by means of the electrodes located in the direction of the current directly above the surface or point being welded."

It took nearly seven years of experience in the Patent Office and the enlightenment of eight rejections to finally convince him and his counsel that, at the best, a most restricted opportunity of invention was before him.

Judge Dodge finds that the only possibility of invention lay in making welds small in area, isolated in comparatively large areas of unwelded surface. Speaking of this he uses language which we would adopt:

"It is difficult to regard the above as an inventive idea. Referring again to the Thomson patent, No. 444,928, the process therein described, while it is said to be 'especially applicable to the welding of plates together at their edges, instead of riveting,' is just as applicable to the welding of plates or sheets at other places within their area as at their edges. The roller electrodes employed, when brought together on each side of the work, and until something more is done, will pass the electric current and make the weld at the spot or point of pressure and nowhere else." (See claim 1 of the patent referred to). "If, having there made the weld, they should be again separated, instead of having the work fed between them while their pressure upon it continued, they would leave an isolated spot weld joining the plates and be in readiness to make another weld isolated from the first by any desired area of unwelded surface."

We are unable to appreciate the distinguishing significance of particular 3, "that the area of the weld is determined by the size of the ends of the electrode and not by the extent of the overlap of the articles being welded." The very same conclusion, we think, is demanded from a consideration of the process and apparatuses disclosed in the patents already referred to. Thus, if in the overlapping offers room enough, the area of the resulting weld depends upon the form of the applied surface of the electrodes whether roller, pin or otherwise. It is only a matter of slipping the plates to be joined far enough over each other.

Nor are we able to agree with counsel's conclusion in particular 4, that there is and can be no extruded metal. Whether or not some metal, softened by the heat, through applying the method in question, will pass beyond the boundaries marked by the electrode faces depends, not upon the method, but upon the skill and care of the operator in controlling the heat and pressure. That seems to be the clear effect of both testimony and example before us, and, without proof, it seems to be an entirely obvious deduction. In demonstrating for us the process in suit upon one of plaintiff's improved machines, plaintiff's expert Gravelle burned a hole through the plates to be welded. He employed an excess of both current and pressure. Had he used less pressure, it is to this court unimaginable that some of the over-softened metal of the plates would not have escaped beyond the peripheries of the points. Too much pressure, too much heat, either or both, it seems, must bring about extrusion. If the point to be welded is well within the limits of both plates, the related pressure outside of the heated area may confine extrusion to microscopic lines. If the spot operated on is near the edge of a plate extrusion will be more apparent. To say that there is no extrusion whatever is not borne out by the facts. This is actually illustrated in this case in Plaintiff's Exhibit



2 to interrogatories, showing an infringing product. In that the second weld from the top shows plainly slight extrusion and at the bottom weld the escape of some metal under the pressure is still more apparent.

Particular 5 is not exclusively an advantageous incident of the process in question. Parts are united in situ and while stationary in the process described in the patents considered above. Any movement they make is that preliminary to the welding to arrive at the welding place, and not in the immediate process. In these disclosures, as in Harmatta's process, the plates to be united are not brought together for the purpose of thus conducting the current as the contact, but are fed together to the electrodes which carry the current to them as they are in contact.

We are of the opinion, therefore, that this invention is anticipated in all senses and particulars in the prior art, a consideration of which art also suggests that there is no room to claim here for a new process which is worked out through a novel aggregation of old ideas not hitherto found in combination. None of these advantages seem to us to be new, nor is their association novel. We are pleased to note that Harmatta's attorney (when there was a real contest on the merits in the interference, that is, before the Thomson Company took both sides of that controversy) held to a view which, if good, supports our conclusions respecting the illumination of the prior art. Defending against the insistence of Rietzel's attorneys that silence in the specification as to spot-welding from the amendment of 1904 to that of 1910 amounted to an abandonment or disclaimer, Messrs. Duffy and Sons (brief) argued to the Patent Office that spot-welding was saved on the ground of mechanical equivalency, citing *Hurst vs. Cassidy*, 62 O. G. 1965 (43 Fed. 257). On this theory there is little question that the prior art has occupied the field except the possibility suggested by Judge Dodge (227 Fed. 431) which he concluded was non-invention, that Harmatta cannot be credited with any new idea:

52        "Beyond that of making his electric welds small in area, rather than large, in comparison with the areas of the opposed surfaces to be joined, and isolating them so as to leave each surrounded by a comparatively large area of unwelded surface."

But if the exact idea is not found in the prior art,—if the idea was new in 1903—was it so significant a variation as to call upon inventive ability to develop it? We are fully aware of the danger in retrospective analysis, and we appreciate the demand that mere narrowness of departure from previous disclosures must not be allowed to defeat a meritorious invention. We likewise understand that the personal equation on the bench embarrasses a just application of the principle that that is invention which may be seen to be something more than that a fair deduction from prior art or usages which should readily occur to one reasonably skilled in the art and reasonably intent on its application. In the judgment of this court, more mistakes, pro and con, are perpetrated by the bench in the application of this principle than any single other. So much depends upon the vision or imagination of the individual who sits in



judgment. But, after all, what does this record plainly show? First, that suggestions of more or less potency did abide in the prior art. Second, that it required a hint from an examiner, after the applicant has suffered years of reverses, to advise the latter that he may have stumbled on a patentable idea. He suffered final judgment against himself in Canada upon a duplicate of his American application before he awoke, and, what is the plain inference from his preliminary statement in the interference case, rejections in several other countries where it is the practice to carefully examine the prior art before allowance. Third, it is in evidence here that the prior art so far advised others, that they, before Harmatta's filing date, readily modified existing apparatus to do, with success, precisely what we have before us in the Harmatta patent. We are not confined to reasoning merely that the idea in question was one which one reasonably skilled in the art and intent on its application should entertain without inventive effort—we find two instances at least where, when the demand came for the practice, the idea came also. This does not happen to be an instance where the art was broadened ever so slightly by one mind to meet a great demand of progress, with no contemporaneous effort meeting

53 the situation as adequately. Nor is it a case where the substance of the invention was not followed until the method of the alleged inventor in question became well known to the effect that such a circumstance, itself, would be "pregnant evidence of its novelty, value and usefulness." *Magowan vs. New York Belting & Packing Company*, 141 U. S. 332. The infringing machines have a genealogy even anteceding Harmatta's in this country, and they were earlier on the general market than their rivals. So we sympathize with the reluctance of Examiner Rich in passing the application for allowance, for we do not consider that Harmatta was an inventor entitled to a patent in the instance before us. It appears to us that, considering the prior art, "the improvement described in the patent was within the mental reach of any one skilled in the art to which the patent relates, and did not require invention to devise it, but only the use of ordinary judgment and mechanical skill." *Phillips vs. Detroit*, 111 U. S. 604-607.

Respecting the application of the principle in question, we think the case on the facts is in the same general category and controlled by the fact conclusions of such cases as *Atlantic Works vs. Brady*, 107 U. S. 192; *Morris vs. McMillin*, 112 U. S., 244; *Hollister vs. Benedict & Burnham Mfg Co.*, 113 U. S. 59; *Hendy vs. Miners' Iron Works*, 127 U. S., 370. If, for instance, Brady did not invent anything patentable (*Atlantic Works vs. Brady*, supra) by projecting from the stem of a dredge, extending a substantial distance below the bottom of the boat, a so-called mud fan, being a set of revolving blades somewhat similar in shape to those of a propeller but sharper on their fronts and less inclined on their faces, which, propelled by an extra engine in the bow, were to stir up a river bottom by their rapid revolutions that the sand and mud might be carried off in a current of muddy water, because it was not an uncommon practice theretofore to disturb the bottom of a channel to be dredged through the action of vessels' propellers, whether the dredge proceeded back-

wards or forwards it is difficult to see where any more dignity should be accorded to Harmatta's spot-welding idea which involved and did nothing more than apply electric current and pressure to superposed metal plates to the same effect, substantially, as if the roller electrodes of the prior art were employed for pressure and current but not revolved.

54 We have alluded above to the McBerty alleged anticipatory use. The evidence in this case is clear that from an experience McBerty once had with a butt-welder was evolved the infringing machines producing a large business which is imperiled by this litigation. There is no fair opportunity in the record to even suggest that this evolution was initiated or assisted by any knowledge of what Harmatta was doing. We are compelled to find that this was wholly an independent matter.

To make the defense of prior use, the defendant has the burden to prove, beyond a reasonable doubt, that at a date prior to December 3, 1903, the Harmatta idea was reduced to successful practice in one or more of the instances pleaded. We think the defense is made in the proof of McBerty's experience in 1901. McBerty's credibility is savagely and most skillfully attacked, but, in our judgment, not always fairly. Several instances are noted where the record is somewhat violated to make a point against his veracity. For instance, plaintiff says in its brief that the Warren catalog of 1901 offered in evidence is inconsistent with McBerty's claim that steel centers were used at that time, but the quotation from the catalog used to make the point applies only to the high-class machines described as A-fans, whereas McBerty is speaking of the cheaper fans known as G-2, which, according to other witnesses than McBerty, had pressed steel centers in 1901. There is no representation in the catalog that the G-2 fans had brass centers. In attempting to describe the much discussed Exhibit M and its relation to Exhibit P, counsel insist in the brief that,

"McBerty admits that Exhibit P was not made at the same time as Exhibit M and not until long after, because he says that the piece which has been cut from the fan of Exhibit M, and which he says appears in Exhibit P was not cut off from Exhibit M until 'quite a long while' after the fan blade of Exhibit M was welded to the spider."

But it is very plain in the record that McBerty is not talking about Exhibit P as cut from Exhibit M a long time after, but he is speaking about another piece cut from the extremity of the blade, the balance of which remains as Exhibit M.

55 There is, however, so much plain room for debate whether we should receive Exhibit M and the cut of a G-2 fan in the Warren 1901 catalog for everything that McBerty claims for them that, if McBerty were not strongly corroborated in the indispensable details of his story, we could not say that reasonable doubt whether the alleged prior use was had is eliminated from the proof. In saying this we do not mean to say that he is to be regarded as an alto-

gether unreliable witness, or that we do not believe the essentials of his story, but, even taking him as counsel for complainant picture him,—go as far as they do in discrediting him as offering to suppress evidence by sale to the Thompson Company—assume with them that Exhibit M is a recent product, bearing a false date,—reject as wholly fabricated his story that the cut of G-2 fan in the 1901 catalog was made from a photograph of one with spot-welded blades—quote to the limit his concessions of conduct in 1913 which was devoid of frankness to Howe and others—judge his value as a witness in the light of his very great interest in the outcome of this case,—still we find convincing testimony from others which not only makes evidence directly but effects complete corroboration of the essential features of McBerty's claim. It is not indispensable to the defense of prior use in the Warren factory that we should be convinced either that Exhibit M is just what McBerty says it is, or that the illustration of the G-2 fan in the 1901 catalog is from a photograph of a spot-welded fan. If true, these circumstances afford strong proof; if false, the defense is affected only through the discrediting of one witness.

We think it is proven here beyond a reasonable doubt that sometime early in 1901, whether February or later is not material, a machine was operated in the Warren Specialty & Electric Company's plant at Warren, Ohio, adapted by McBerty from a butt-welder, which successfully spot-welded a small quantity of fan blades and that these, in assembled form, went into distribution in trade. No one is here to dispute by any direct testimony that Exhibit B (McBerty's alleged welder) did not do in 1901 in the Warren factory what the court saw it do in the progress of this hearing, and there are many unimpeachable witnesses who identify it and speak for it

and as to what it did then. That what is successfully exploited then was the Harmatta process there is no room for question. Of course witness Lipps is weakened by his mistake as to the year he worked in Warren, and we must not overlook Captain William E. Smith's relation to the case, but no other witness is subject to any reasonable discrediting suggestions. Major Crafts, Powers, Gilder and McDonald are convincing witnesses, so are others to minor matters. This court believes them, and, believing them, we find some additional evidence in the McBerty and Lipps testimony, and very much in that given by Capt. Smith. Indeed, there is no good reason at all in discrediting the last as a witness in any degree, for his connection with this case is in no wise inconsistent with an entirely fair position as a witness, and he offers nothing that is not entirely creditable. Five highly credible witnesses not only identified Exhibit B as the machine they saw in 1901, each of them having an individual and appealing reason for identification, but they fix the general date beyond question by reference to contemporaneous matters of both public and private interest. Some of them saw it successfully spot-weld, and all of them saw its product as worthy of and in the process of entrance into commercial channels. To say that these witnesses are not telling the truth is to say substan-

tially that they are deliberately perjuring themselves, for their testimony is so individualistic that there is no fair chance to say that it is the product of a stimulated retrospective imagination induced by interest or friendship or for some other reason not highly discreditable. When McDonald, for instance, says that not only did he see McBerty weld a complete fan in 1901 but that he, in 1901, used a spot-welded fan as a test fan in the performance of his own duty as the final inspector of completed devices, and, with it, as the criterion, tested and passed to the packers the product of that grade to go into the market, some of which had spot-welded blades, he is either reciting an important fact or is perpetrating a deliberate fabrication. We may make the same observation of the essentials of the testimony of Major Craft, Capt. Smith, Gilder and Powers. Taylor's testimony also has some corroborative value because of his statement that in 1903, in the Peerless works, he saw Exhibit B, which he identifies, and used it to make spot-welds. In addition, the plaintiff  
57 itself introduced the affidavit of Frank G. Brown (deceased), given to Mr. Howe in 1913. Brown fixes the date of a Sunday visit to the Warren factory as prior to May 6, 1901, by reference to other transactions. There he saw Exhibit B and some spot-welded fan blades, but, there being no current on Sunday, he did not see a spot-welding operation. Subsequently, in the Peerless factory, he saw the same machine in use for both butt and spot-welding. The testimony of Ensor has some importance as corroboration. Of him also must it be said that he must have told the truth as to the essential feature of his testimony or he deliberately fabricated it. If he saw in 1910 or 1911 in the scrap room of the Peerless factory a completed fan having spot-welded blades, the fact is important. From what we are permitted to know in this record of the sleuthing activities and disposition of the man Newton A. Smith, an agent of the plaintiff, who was present in the court room but who did not deny the somewhat discreditable reflections upon him given by witnesses for the defense, little surprise is called for by the fact that subsequent to his visit to the Peerless factory this fan seen by Ensor could not be found. Some inconsistencies, discrepancies and omissions do, in fact, appear in the affidavits Mr. Howe took in 1913 from some of the witnesses spoken of above, but such situations are usual and are the well recognized weaknesses of affidavit testimony. It is usually not the composition and *berbiage* of the affiant, and it generally suffers in substance because another mind intervenes, with interpreting and diluting effect, between the witness and the auditor of his testimony. Aside from this, plaintiff meets this evidence with testimony, largely negative in character, which is, if disputatious at all, only inferentially and feebly so.

It cannot be said that the work at Warren was a mere experiment afterwards abandoned. The fact that witnesses speak of the incident as an experiment is not proof. Whether it was such is a mixed question of law and fact, to be determined from all the evidence and not by the loose terminology of lay witnesses. The force of the testimony is that the trial was successful, and that its product got into commercial channels. Not only was there no abandonment, as that

58 word is used in this connection, to be interpreted by the nature of the work as merely experimental, but a few years later Captain Smith constructed a successful spot-welding machine for the Carnegie Company as a result of his knowledge of what Exhibit B would do, gained in 1901, and Taylor, aided by his knowledge of Exhibit B, designed for the Winfield Company a line of spot-welding machines which came into general use before the devices emanating from Harmatta were generally known in this country. The contest here is actually against alleged infringing processes performed on machines lineally descending from McBerty's apparatus of 1901.

It is urged upon us by the plaintiff that the case on the facts and as to prior uses is within the authority of a number of decisions, the principal and most authoritative being the Corn planter patent, 23 Wallace, 181; Smith vs. Goodyear Dental Vulcanite Company, 93 U. S. 486; the Barbed Wire patent, 143 U. S. 275; Deering vs. International Harvester Works, 155 U. S. 286.

The question is one of the force of the evidence as affected by the quantum and character of the testimony and the possibility of coloration through lapse of time or interest as well as the credibility of witnesses. The cases cited establish the salutary principle contended for by the plaintiff, but the question in each recurring case is whether its particular evidence meets the requirement. Compared with the character of the testimony in this case, the Goodyear case, on the facts, loses any precedent value; there is a wide disparity in evidential force. The same may be said of the facts in the Deering-Harvester case. There every one of the witnesses was under some sort of discredit; and the situation on the fact record is incomparable with what we have before us. Of the Supreme Court decisions (and we are discussing only them because they control the lower courts relied upon by plaintiff), the facts in the Corn Planter Patent (23 Wallace, 181) and the Barbed Wire Patent (143 U. S. 275) most nearly approach, in character and force of the evidence derived from them, the record we have here, but neither of them present established facts of the cogency of those of the record before us.

In the Corn Planter case the decision points out how the alleged prior uses in fact departed in substantial practices from the functions of the invention under attack. In the Barbed Wire case the 59 facts were under special and direct dispute and there were elements of some improbability respecting the actual existence of a pertinent use. In the case of Warren Bros. vs. City of Owosso, 166 Fed. 309, a decision by our own Circuit Court of Appeals and cited by plaintiff, the court not only found definite abandonment, but that the use itself, in its very essence, was experimental. We think these cases and the other cases cited are clearly distinguishable on the facts from the case at bar, respecting the force of proof of prior use.

The case of Lipps is a good example of the wisdom of the rule that proof should exclude reasonable doubt. There is nothing in the record to discredit him for integrity. He has no interest in the case. That he came on the stand and tried to be truthful there is no ques-

tion, but he was mistaken respecting one very important identifying feature, hence, uncorroborated, he, like McBerty, lost much weight. But witnesses, in whose testimonies are weaknesses which disable them from substantially assisting a clear conclusion, when they are considered by themselves, or with other witnesses whose credibility is also weakened, may be so corroborated by the unembarrassed and impregnable testimony of others, that, as to the indispensable details, they again may be heard with a large degree of favor. That is just what has happened here. If all of defendant's witnesses were open to the attacks which were more or less successful in the cases of Lipp and McBerty, the authorities just considered, and others from the lower courts argued to us, might be allowed to control our judgment respecting the conclusiveness of the proof. But the situation is vastly different. On the controlling matter to which these two men speak—did McBerty, in 1901, on Exhibit B, successfully spot-weld, to their spiders, a quantity of fan blades, whether six or two dozen is immaterial, which fan blades were assembled to their motors, and the fans, so manufactured, placed in the completed stock of the Warren Company, to go into the market? On this proposition there are five witnesses directly, and one or two more of indirect value, no one of whom is impeached and they corroborate these weak witnesses. Lipp and McBerty, then, do, in fact, contribute very much that is credible to the court's information.

60 This case, therefore, appeals to us to fall within that category of cases represented by Supreme Court decisions such as Coffin vs. Ogden, 18 Wall., 120; Egbert vs. Lippman, 104 U. S. 333; Brush vs. Condit, 132 U. S. 39, and to be a stronger case on the facts to carry the burden peculiar to a defense of this sort than even Coffin vs. Ogden, *supra*.

If we did not have here Exhibit B so clearly identified as well as the character of its early operation and product, there would be more force to the cases cited by the plaintiff. Exhibit B is a continuing concretion, a piece of evidence the existence of which does not depend, as in the alleged anticipating devices in the cases in question, upon oral testimony. It is to be noted how much more effective is Exhibit B in this case to support the defense than were the alleged Drawbaugh devices in the Telephone cases, 126 U. S., 1, 566. Much of Exhibit B, just as it was in 1901, is before us and its present reconstruction as it was then is well established by those, besides McBerty, who had every reason to know all its details as they were then. That it will successfully spot-weld was demonstrated. So Exhibit B appeals to us as established as a concrete, visible, contemporaneous and most important matter of "proof which tells its own story." The reason for the rule demanding conclusive proof of prior use is the ease with which such proof may be fabricated or colored, either corruptly or generally, through the effect of interest or friendship stimulating a memory to confuse fact with imagination. We have seen the witnesses as they spoke on the stand. The naturalness of their stories suggests want of co-operation. They corroborate each other in the varying scopes of their experiences with Exhibit B. Their testimonies are to such important things that, if unreliable in substance,



there is no escape but to assign wilful perjury as the cause by a number of men whose credibility is not subject to attack from anything that appeared before us. The testimony of Smith, Crafts, Powers, Gilder, McDonald, Taylor and Ensor, and Brown (by affidavit) is all perjured—every one of these men, as well as Lipps and McBerty, is foresworn, if this allegation of prior use is substantially untrue. Perjury is unthinkable with such men as these men appear to be. Besides, their stories have in them no element of the unusual or unexpected. What they say McBerty did in 1901 is just what we can see one interested in the matter might readily do in due course of satisfying his interest. The incident was a logical step, plainly indicated in the condition of the prior art. Rietzel's experience is an independent parallel.

The defense designated by (c) above, that the subject matter of the grant was never entered under cover of the inventor's oath, is new to this case. If, however, the decision of the Barney & Berry case (227 Fed. 428) should be regarded as decisive, it would fail because it is based upon the theory that, while the case was pending in the Patent Office, there was a substantial departure from the original specification and claims, and the final grant was for something not in the case at all, as Harmatta's invention, until January 27, 1910. In the Barney & Berry case, the ninth defense was that Harmatta's original application did not disclose the method of the final grant and that while the application was pending it "was unlawfully broadened with intent to cover the successful method and article of the defendant and others." Although the Circuit Court of Appeals of the First Circuit said that this defense was specially urged to it, again, as to it, the decision is aggravatingly uncertain, and we are left to conjecture very largely to determine just what was the thought of the court respecting this matter, although the inference is impelling that judgment on this defense is against the defendant. If the court reaches that conclusion, however, on the basis of facts as it attempted to recite them, we are privileged to give the decision only perfunctory consideration. What is said about the matter is indefinitely confined to but a few lines in which occurs this statement, to which we cannot agree:

"The patent was applied for on December 3, 1903, and was not issued until December 3, 1912; but the claim for spot welding was always in the application."

As already indicated by us, we are unable to find any claim for spot-welding, as such, before the amendment made in 1910, following the hint of Examiner Shaw, given more than eleven months before. Certainly there is no direct claim for spot-welding in the original application. Everything that even indefinitely touched upon it was taken therefrom in 1904 and was not put back for nearly six years. This condition of the record was the subject of elaborate argument by counsel for Rietzel in the interference proceedings between the Rietzel grant and the Harmatta application. In support of a motion to dissolve, upon the ground, for instance, among others, that Harmatta had no right to predicate the



article claims in interference because there was no supplemental oath attached to his amendment of 1910 to support them, counsel for Rietzel in behalf of the Thomson Company, before the Examiner and before the Commissioner, on appeal, produced arguments which seem to us conclude the proposition in their favor. It is interesting to note that in the interference proceedings, the question raised and so ably argued was not decided, the holding in each instance being that it was not to be heard on interference—that it was purely an *ex parte* matter.

While the defense is broadly stated in this case, it is, in argument, raised specially to the article claims, 16 to 21, inclusive, which were taken bodily from Rietzel and were never, prior to 1910, claims in any form in the Harmatta application. The question is not argued at all by counsel for plaintiff in this case. Whatever may be said respecting the abandonment or disclaimer of whatever disclosure there was in Harmatta's original application of spot-welding, as very persuasively argued at one time in the proceedings by counsel for the Thomson Company, it is true that there was no hint of a demand for article claims until 1910. It seems to us inevitable that under the decision in *Steward vs. American Lava Co.*, 215 U. S. 161, affirming our own Circuit Court of Appeals, these claims (16 to 21) must fall, and that a decree in that respect, at least, should run against plaintiff. See also *Yale Lock Co. vs. Greenleaf*, 117 U. S. 554, 559.

We prefer to discuss the alleged Rietzel prior use in connection with a defense which is peculiar here, which is, in our judgment, the most important because it not only effects the interests of the parties immediate to this case, but it raises a question of great public concern when we consider what the public relation to a patent grant is. While the defense is ostensibly but incidental estoppel, although as to an important matter, in effect it goes much farther because there is measurably involved in it the very integrity of the principle of patent monopoly. Judge Baker, in *Railroad Supply Co. vs. Hart Steel Co.*, 222 Fed. 261, 274, explaining the reason why a presumption of validity of the grant should be indulged and why priority of use must be established beyond a reasonable doubt, called attention to the fact that a patent is a "contract between the government on behalf of the people and the patentee," and that it is the fruit of an examination "on behalf of all the people" by public experts. Clearly the function of the Commissioner of Patents is to shield the public from the imposition of an unjustified monopoly. One is given a patent monopoly for seventeen years as a premium for a real contribution to science and useful arts. As Chief Justice Marshall said in *Grant vs. Raymond*, 6 Peters, 242:

"It is the reward stipulated for the advantages derived by the public for the exertions of the individual, and is intended as a stimulus to those exertions."

No one is entitled to this reward unless he produces some cogent proof that this contribution has first been made by him or in his behalf. His proof must be to those appointed to safeguard the public

against an improvident grant. He is protected by a presumption of the validity of his grant and he cannot be allowed to obstruct, directly or indirectly, that intelligent and full examination which, only, secures provident action by the public's representatives. The time within which he may enjoy the fruit of an invention by way of monopoly is strictly limited by the power of Congress. Defendant claims that the conduct of the Thomson Company in the obtaining of the patent to Rietzel and also perpetrated in the Rietzel-Harmatta interference proceedings estops it from asserting priority of Harmatta over Rietzel, and from questioning a prior use by Rietzel which would invalidate the grant sued on. If that contention is good, plaintiff's case must fall. What are the facts? February 25, 1905, Rietzel, then superintendent and general manager for the Thomson Company, applied for a patent, assigning to his employer. The original specification stated that it was for "a method of forming an electric welding union between the plane surface of a piece of metal and another piece of metal and is especially useful in uniting two plates or sheets of metal at their plane surfaces." One claim (No. 8)

was broad enough to cover the alleged invention of Harmatta.

64 In June, 1908, while the application was on an appeal to the Board of Examiners in chief, from a rejection by the primary examiner, the latter found an anticipating reference in Harmatta's English patent, No. 22,981, of 1903, granted August 25, 1904, upon the filing of a complete specification July 25, 1904. Thereupon the case was remanded upon the insistence of the Thomson Company's counsel that they desired to be heard before the primary examiner upon the reference. An amendment was then filed in the form of a complete new specification with an enlarged list of claims (23 in number), manifestly drawn to meet every conceivable phase of the Harmatta disclosure. In support of the amendment Rietzel's affidavit of October 23, 1908, was filed to the effect that he successfully practiced the invention in the application as amended sometime in June, 1904. His practice was described in detail. In December, 1908, his claims were rejected, particularly upon certain French patents to one Egel who was Harmatta's assignee in France. These patents were published February 18, 1904. The Harmatta patents in England and France (one of those to Egel) made the same disclosures as Harmatta's original specification in this country. Thereupon to met the examiner's rejection, the Thomson Company filed Rietzel's affidavit of February 18, 1909, to the effect.,

"That prior to the 18th day of February, 1904, he repeatedly, successfully practiced the method of fastening two sheets of metal together face to face by welding them at spots in their meeting surfaces by confining the heating electric current passed from one plate to the other in such spots and localizing the welding pressure at said spots as claimed broadly in said application."

The affidavit further stated that he successfully worked at the plates at the factory of the Thomson Company, and, in further detail, described the character of the practice, relating it undoubtedly to the alleged Harmatta invention. Through the assistance of these affi-

davits, allowance of the application was obtained, and the patent issued July 20, 1909, under the number 928,701, with fifteen process claims and five article claims. The pending Harmatta application (filed December 3, 1903) was unnoticed.

65 We have already noted that the Harmatta application was enriched in 1910 by the adoption of a number of the claims from the Rietzel grant as the basis for interference proceedings. To succeed in this interference, it was necessary for Rietzel, who was the junior party, to file a preliminary statement to which his evidence should be addressed. This must claim a successful use antecedent to Harmatta's filing date, December 3, 1903. Therefore, June 14, 1910, Rietzel, produced by the Thomson Company, gave a verified preliminary statement to the effect that he conceived the invention set forth in the declaration of interference in 1897 and that, as nearly as he could fix the date, it was successfully reduced to practice in July, 1898, then being first explained and disclosed to others, and that the invention had been put to a very extensive use in the manufacture of metal work of various kinds. Thereafter the interference proceedings, declared April 26, 1910, progressed very slowly with several appeals prosecuted by the Thomson Company from the examiner to the Commissioner upon a variety of questions raised in the interest of the Rietzel patent. Numerous stipulations for extensions of time to introduce testimony, often at the manifest application of counsel for the Thomson Company, assisted to prolong the controversy. February 9, 1912, it was shown that Rietzel was in Europe, whereupon a further extension of time was obtained so that Rietzel's testimony in chief was not to close until March 11, 1912. By this time the patience of the examiner of interferences was becoming somewhat weakened, wherefore an order was entered.

"That no further extension of Rietzel's time to take testimony in chief will be granted without a verified showing of reasons why the testimony was not taken within the time hereinabove allowed."

A month later (March 9, 1912), after the entry of this order, and only two days before Rietzel's time was to expire, a stipulation was filed extending the time for taking the testimony for sixty days, supported by the affidavit of Charles F. Tischner, a member of the firm of counsel representing the Thomson Company defending the Rietzel patent, to the effect that for more than six months negotiations had been pending for settlement of the interference between the parties and that the affiant, who had had the case in his personal  
66 charge, for nearly three months immediately prior to the date of the affidavit (March 9, 1912), had been traveling to and from Germany where he was negotiating for the purchase of the Harmatta invention in behalf of the Thomson Company; that the papers transferring the Harmatta application to the Thomson Company had been executed and were in transit, to arrive in a short time. The affidavit further stated, in face of the admission that the owner of the Rietzel patent had practically acquired the Harmatta interest, that

"it is desired to take testimony in the interference on behalf of the party Rietzel; that it is expected that such testimony can and will be taken and completed within the sixty days' extension of time now requested, and that the request is made in good faith and not for the purpose of delay."

How can it be said that the statements just quoted from Tischner's affidavit are true, and the promise therein offered in good faith? Later we deal with the contract between the Silesia Company and the Welding (Thomson) Company. It is there shown that at the very time Tischner made this affidavit he, himself had closed a negotiation which made the statements of the affidavit impossible. Nevertheless, it served as a pulmotor for the Rietzel grant for the time being, for it caused to be approved a stipulation further extending time (to May 11) to take testimony and undoubtedly was efficacious to effect still another delay to July 12. Later we note how it saved time to begin another suit on the Rietzel patent. When July 12 arrived, Rietzel, of course, was in default. The attorneys for the Thomson Company who had in charge the company's Harmatta interests demanded a hearing on a motion for judgment by default on July 23. On July 24 the Thomson Company's Rietzel side of the simulated controversy was granted two weeks to show good and sufficient cause why default judgment should not be rendered. Not answering this notice, on August 7 priority of invention of the subject-matter in issue was awarded to Harmatta, the senior party, with a limitation of appeal to August 27. There being no appeal, the Harmatta patent issued in due course as of the date December 3, 1912. The record shows that nothing substantial, if anything, stayed the granting of the Harmatta application early in 1910 except the filing of Rietzel's statement in the interference under  
67 date of June 14, that he had anticipated by successful use Harmatta's filing date by a period of five years and a half, the use being followed by a successful reduction to practice in many ways. The delay occasioned by this affidavit was extended well into 1912 by that of Tischner.

The evidence before us shows that Harmatta executed an assignment of his application to the Thomson Company in Berlin February 3, 1912, undoubtedly while Tischner was there. There is in evidence also a contract executed in Berlin between the Thomson Company and the Silesia Company, the then owner of the Harmatta application. The date (April 3, 1912) to this contract (we have only a copy) must be an error, probably for February 3, for we find Tischner, who signed it in Berlin for the Thomson Company, swearing, on March 9 and in Washington, that it already had been executed. Harmatta's assignment to the Thomson Company was actually recorded in the Patent Office April 5, 1912. In the contract the Silesia Company agrees, in consideration of \$27,500.00, to deliver an assignment from Harmatta to the Thomson Company. Of the consideration, \$7,500.00 were to be paid upon the delivery of the assignment and the balance according to paragraph 5 of the contract, which should be read with paragraph 6:

"5. The Welding Co. further agrees to pay to the Silesia Co. a further sum of Twenty Thousand (\$20,000) dollars immediately upon the issue of a United States patent to the Welding Co. for the said invention and application for patent of said Johann Harmatta provided said patent is granted with the present claim 1 of the Harmatta application or a claim of equal scope therewith. For identification said claim is as follows:

"The process of electrically welding thin metallic sheets, which consists in introducing the sheet metal parts to be welded between electrodes, pressing said electrodes firmly together and closing the circuit, whereby the specified small round, very sharply defined place of welding which answers the purpose of a rivet is obtained, substantially as set forth."

68 "6. The Welding Co. covenants and agrees to vigorously prosecute said application for patent at its own cost and expense and to use its utmost endeavours and those of its legal advisors and attorneys to secure the grant of said patent with a claim of the scope defined in the fifth clause hereof."

This claim 1 was originally claim 2 of the application as amended January 27, 1910. A further amendment was made when the Rietzel claims were taken over for interference purposes, and it became claim 1, followed by the claims taken from the Rietzel patent. After the interference was "won" for the Harmatta application, further amendment dropped this claim. Evidently the expansion, by this last amendment, of the claims from fifteen, which was the number existing when the interference was ended, to twenty-one, as allowed, was considered to occupy the ground covered by this claim 1. Under the contract the Silesia Company retained certain rights of importation which made it necessary to it to have the patent include the scope of the required claim.

Although the Thomson Company was already under this solemn contractual obligation to discard the Rietzel patent and allow the Harmatta patent to issue, for the latter displaces the Rietzel patent to the extent that they conflict, we find it suing the United States Metal Products Company in the United States District Court for the Eastern District of New York on a bill of complaint filed March 28, 1912, setting up the Rietzel patent and asserting, over the oath of its secretary, that Rietzel, prior to February 24, 1905, was the inventor of useful improvements in welding "since commonly known in the art as electric spot or point welding," that is, asserting for the Rietzel patent precisely the force which the Thomson Company had solemnly agreed to allow to Harmatta's claim. Also, November 17, 1910, while the interference proceedings were continuing, and nearly five months after the Thomson Company had filed Rietzel's affidavit to anticipate Harmatta, this company, as Rietzel's assignee, began an action in the Circuit Court of the United States for the Southern District of New York against The National Enameling and Stamping Company for infringement of the Rietzel patent, alleging Rietzel to have been, prior to February 24, 1905, "the original and first inventor of certain new and useful improvements in uniting

69 component parts of sheet metal structures, since commonly known in the art as electric spot or point welding." The evidence is also before the court that, during the extended period of the interference proceedings and while the Rietzel patent had an apparent vitality afterwards denied it by concessions of the owner, the Thomson Company asserted it in several instances to the extent of demanding and receiving profits upon it as a monopoly, although under contract to displace it.

Another curious circumstance which is of some interest, at least, in this connection, appears in the record to this effect: Patent having issued to the Thomson Company, as the assignee of Harmatta, after this company, as the assignee of Rietzel, in the interest of the new patent, had abandoned all its solemn insistence of priority in Rietzel, and while the appeal in the Boston case was pending, a disclaimer was filed by that company of claims 1 to 6 and 16 to 20 of the Rietzel patent, being claims 1 to 6 and 17 to 21 of the Harmatta patent and a further disclaimer of that part of the final specification of Rietzel which identified broadly the Rietzel invention with that of Harmatta. The necessity for the disclaimer was obvious under the circumstances and we are not as much interested in the fact as in the reason which was given, as follows:

"That your petitioner has reason to believe that through inadvertence, accident or mistake, and without any fraudulent or deceptive intention, the patentee, in said Letters Patent, has claimed more than that of which he was the original or first inventor or discoverer."

This is a remarkable statement in view of the facts—that twice in the process of amending the specification the clause now disclaimed, which was the foundation for the disclaimed claims, was insisted upon—that even after allowance to Rietzel the specification and claims including these disclaimed portions were held up for the two successive revisions, in the last of which was added one (number 20) of the claims sought to be disclaimed—that as soon as Harmatta's work became known, through the English disclosure, Rietzel's counsel occupied the ground by amendment and by expanding the claims in number from 3 to 23, with a brief asserting very definitely that Harmatta was to be anticipated—that to support

70 this occupation of the Harmatta territory Rietzel was made to affirm on oath his priority (affidavit of October 23, 1908)—and that prior to the second of the amendments containing these now disclaimed matters, and for the evident purpose of definitely sustaining them as essential portions of his invention, Rietzel was caused to file another affidavit (that of February 18, 1909) in which he more specifically identified, as that which he had done to anticipate the disclosures of the Egel (Harmatta French) patent, the very things afterwards repudiated as unintended. How this evident taking of Harmatta's ground could have been "through inadvertence, accident or mistake" is, in view of these facts, beyond comprehension. The disclaimer is equiva-



lent to saying that Rietzel's affidavits just referred to were fabrications, and wilful ones, too, for they (especially so in the second) were too particular and pointed to allow it to be said of them that their statements were the result of "inadvertence." In this same connection the mind reverts again to Thomson's affidavit, already referred to, of November 30, 1908, filed to support that amendment which was the first to contain this alleged inadvertence and accidental matter. In this affidavit Thomson says:

"That he is familiar with the process of electric welding set forth in the above entitled application of A. F. Rietzel for uniting sheets of metal together by what has been known as the 'spot-welding process' and which forms a practical substitute for the riveting of plates together or for other mechanical expedient for fastening them together face to face;

That one of the methods of uniting pieces of metal together by riveting and for which the aforesaid spot welding process forms a valuable substitute was patented by him by United States Letters Patent dated January 8, 1889, Patent No. 396,015."

These paragraphs precede the one already quoted in which Thomson endeavors to contradict the import of the specification in his patent 396,015. Thomson, when he gave this affidavit, surely knew that Rietzel was being made to claim the things which were afterwards disclaimed. He was not only then and at all times an officer of the disclaimant, but its expert on these very matters.

71 The question of the candor and good faith of this disclaimer grows in seriousness when we recall that it was upon these identical features of the Rietzel patent that the Thomson Company brought the two suits above referred to and proceeded to issue many licenses; and further, when we note that Harmatta's allowance was stalled for more than two years by a further repetition of the "inadvertence, accident or mistake" in the shape of Rietzel's affidavit of June 7, 1910, filed in the interference proceedings. The "invention set forth in the declaration of interference," which his assignee (the Thomson Company) had in him then swear he conceived more than a dozen years before was, as the counts in the declaration show, precisely that which the specification paragraph and the claims now attempted to be disclaimed were in the application to cover. It was to maintain them that the affidavit was filed. The statement in the disclaimer explaining why Rietzel took Harmatta's ground is plainly untrue—it is difficult to resist an impulse to say that it is deliberately untrue. The Thomson Company made a record which very plainly belies its assertions. The incident is more illustrative than directly applicable to the special defense in question, but its illuminative powers are very important.

The Thomson Company will have made this "inadvertence, accident or mistake" extremely profitable, if plaintiff is allowed to maintain its Harmatta patent, for then it will follow that it has obtained protection of its monopoly of this invention from July 20,



1909, to December 2, 1929. It is clear to this court that such a result, upon this record, should not be allowed to follow through the favorable adjudication of plaintiff's right to maintain action on the Harmatta grant. It seems to us clearly against public policy and subversive of equitable principles to give plaintiff a decree which, in sustaining this patent, will operate to give it a monopoly not sanctioned by law.

Pomeroy (Equitable Jurisprudence, Third Edition, Vol. II, Sec. 805), upon authority of many decisions, sums up the conditions which must be met that equitable estoppel may exist, as follows:

- 72 "1. There must be conduct—acts, language, or silence,—  
amounting to a representation \* \* \* of material facts.  
2. These facts must be known to the party estopped at the  
time of his said conduct, or at least the circumstances must be such  
that knowledge of them is necessarily imputed to him. 3. The  
truth concerning these facts must be unknown to the other party  
claiming the benefit of the estoppel, at the time when such conduct  
was done, and at the time when it was acted upon by him. 4. The  
conduct must be done with the intention, or at least with the ex-  
pectation, that it will be acted upon by the other party, or under  
such circumstances that it is both natural and probable that it will  
be so acted upon. \* \* \* 5. The conduct must be relied upon  
by the other party, and, thus relying, he must be led to act upon  
it. 6. He must in fact act upon it in such a manner as to change  
his position for the worse."

Each of these six conditions are present in this record, when we consider that a patent grant is adverse to the record when we consider that a patent grant is adverse to the public which is a party to the allowance through representation. The disclaimer which we have just been considering is to be regarded in connection with Pomeroy's fourth requisite that "the conduct must be done with the intention, or, at least with the expectation, that it will be acted upon by the other party, etc." Of course when the Thomson Company caused the Rietzel application to be amended to cover the Harmatta territory, and obtained from him the two affidavits under consideration, and from its welding expert, Thomson, another, the purpose was to affect the judgment, in these precise matters, of the public's representatives in the patent office. So, also, that was the object of Rietzel's affidavit in the interference, as well as that of Tischner, asserting that it was proposed, in good faith, to show, if the time for taking testimony were further extended, that Rietzel had priority over Harmatta; an affidavit made immediately following affiant's return from Europe, where, for his principal, he had entered into a contract to perform which made it impossible to meet the terms of the promise in his affidavit. The purpose of these affidavits was to vitalize, against opposition, the Rietzel claim of monopoly to precisely the features of invention which were after-

wards attempted to be disclaimed. They effected their obvious purpose to the great advantage of the Thomson Company which the latter pugnaciously held until, obtaining the Harmatta interest, it no longer needed the protection of the Rietzel grant. To allow the affidavits to be repudiated now is to allow plaintiff to take advantage, to the disadvantage of the public, of what it now would admit was its own wrong against the public. The case before us is in principle covered by *Union Manufacturing Company vs. Lownsbury*, Federal Cases, 14, 368. Either the Rietzel affidavits state the truth or they were deceptive, intentionally so or most recklessly devised and employed. If they state the facts, we have in the circumstances a prior use displacing Harmatta as an inventor. If they are subject to criticism as untrue, the plaintiff who is intelligently responsible for them, is in this court with unclean hands. It cannot be heard to plead a culpability from which it so greatly profited. It is fair to Rietzel to say that he had no part in the disclaimer. He was not aware, even, that Harmatta had prevailed over him in the interference until so advised by this suit.

We must hold that plaintiff has estopped itself to deny priority in Rietzel, which it so frequently and pertinaciously asserted against the public for years, and that the estoppel is available to defendant here. This alone defeats plaintiff's demand for a decree.

It is difficult to understand how the Patent Office should have allowed itself, without investigating the truth of Reitzel's claim of prior use, to allow by default to Harmatta the invention after it was apprised that both sides were occupied by precisely the same interest, and that to the Thomson Company there was a very great advantage that the office should quietly act as it did. No matter what the office practice was, here it operated to give Harmatta's assignee an undue advantage over the public.

A decree may enter finding the patent invalid and dismissing the bill. October 5, 1920. John M. Killits, District Judge.

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#### **Decree Dismissing Bill With Costs.**

(Entered October 5, 1920, by Judge John M. Killits, Sitting by Designation.)

This cause having come on regularly for trial before this Court, and having been submitted for decision on the pleadings and evidence taken and filed therein, and the Court having heard the arguments of the attorneys for the respective parties, and having duly considered said pleadings and evidence, it is now ordered, adjudged and decreed that the plaintiff take nothing by its suit and that the bill of complaint herein be dismissed. And it is further adjudged and decreed that the defendant do recover against the said plaintiff its costs and charges by it in its behalf expended, to be taxed. John M. Killits, District Judge.

O. K. as to form. Stevenson, Carpenter, Butzel and Backus.

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**Plaintiff's Petition for Appeal.**

[Filed Dec. 16, 1920.]

To the Honorable the Judge of the District Court of the United States for the Eastern District of Michigan, Southern Division:

The above named plaintiff, the Thomson Spot Welder Company, believing itself to be aggrieved by the final decree made and entered in this case as on the fifth day of October, 1920, does hereby appeal therefrom to the United States Circuit Court of Appeals for the Sixth Circuit, and prays that said appeal may be allowed and a citation issued directed to the above named defendant, commanding it to appear before said Circuit Court of Appeals for the Sixth Circuit, to do and receive what may pertain to justice to be done in the premises; that a transcript of the record, proceedings and evidence in the said case, duly authenticated, may be sent to the United States Circuit Court of Appeals for the Sixth Circuit; and that said decree of said District Court may be reversed and such decree made as to said United States Circuit Court of Appeals may seem meet and just. Stevenson, Carpenter, Butzel & Backus, Fish, Richardson & Neave, Counsel for Plaintiff.

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**Plaintiff's Assignments of Error.**

[Filed Dec. 16, 1920.]

And now comes the plaintiff, Thomson Spot Welder Company, and says that in the final decree made and entered in the above entitled case as on October 5, 1919, there is believed to be manifest error, and for errors it assigns the following:

1. The court erred in not holding the Harmatta patent in suit to be a good and valid patent.
2. The court erred in not holding that the Harmatta patent in suit was infringed by the defendant.
3. The court erred in not finding patentable invention in the subject-matter of the Harmatta patent in suit and in the subject-matter of each of the claims of said patent.
4. The court erred in not finding that Harmatta was the first and original inventor of the subject-matter of the Harmatta patent in suit defined in the claims thereof.
5. The court erred in refusing to order an injunction and an accounting as prayed for in the bill of complaint.
6. The court erred in dismissing the bill of complaint.
7. The court erred in ordering that the plaintiff be required to pay costs to the defendant.

Wherefore the plaintiff prays that the decree of the said District Court of the United States for the Eastern District of Michigan, Southern Division be reversed, and that said court be instructed to enter a decree, ordering an injunction and accounting, with costs to this plaintiff. Stevenson, Carpenter, Butzel & Backus, Fish, Richardson & Neave, Counsel for Plaintiff.

**Order Allowing Appeal.**

[Entered Dec. 16, 1920.]

On reading of the petition of Thomson Spot Welder Company, plaintiff, for appeal and consideration of the Assignment of Errors presented therewith, it is ordered that the appeal, as prayed for, be and is herewith allowed.

Cost bond on appeal is hereby fixed in the sum of Five Hundred Dollars (\$500), or in lieu thereof a deposit of Two Hundred and Fifty Dollars (\$250) in cash. John M. Killits, District Judge.

**Petition as to Transcript on Appeal.**

[Filed Dec. 16, 1920.]

The parties join in requesting that those portions of the record in the above entitled cause which have been printed for use in the District Court be used as a part of the transcript on appeal without reprinting or reducing to abbreviated or narrative form the testimony therein. Stevenson, Carpenter, Butzel & Backus, J. L. Stackpole, Counsel for Plaintiff. Melville Church, Counsel for Defendant.

**Statement of Counsel for Both Parties.**

[Filed Dec. 16, 1920.]

Both parties join in making the above request because both parties desire that the testimony of the witnesses shall be reproduced in the exact words of the witnesses.

The reasons are as follows:

This is a patent suit in which each party has already printed the testimony of its witnesses for use in the District Court. In the record of each party there is the testimony of expert witnesses and the testimony of fact witnesses. The testimony of the expert witnesses on direct examination is in the usual form consisting mainly of long answers on expert questions which can not be condensed. The cross-examination of these expert witnesses is brief and its force and significance would be materially altered if attempt were made to condense it and reduce it to narrative form.

The testimony of the fact witnesses on both sides deals with controverted questions of fact concerning which it is important that the testimony should be reproduced in the exact words of the witnesses because if this were not done the significance, force and effect of the testimony would be altered so that the Appellate Court would not have before it the same record which was before the District Court.

The plaintiff's testimony, consisting of three hundred and twenty-nine printed pages, was taken entirely by deposition out of court

and is in the usual question and answer form but is printed clearly and without confusion.

Of the defendant's testimony consisting of five hundred and twenty-eight printed pages, pages 6 to 223 and pages 439 to 534 were taken by deposition and are printed clearly and without confusion. Pages 225 to 438 were taken in open court and are printed clearly and without confusion although the interjections of counsel and the remarks of the court are occasionally recited. This

79 testimony relates almost entirely to the so-called McBerty prior use concerning which it is very desirable that the testimony should be reported to the Court of Appeals in the exact words of the witnesses in order that the true significance, force and effect of the testimony may be before that court.

It is therefore the sincere opinion of counsel for both parties that no attempt should be made to reduce the testimony of the witnesses to narrative form, but that the record for both parties as printed for the use of the District Court should be used as the record on appeal. J. L. Stackpole, Counsel for Plaintiff. Melville Church, Counsel for Defendant.

#### **Opinion on Application to Not Put Record in Narrative Form.**

[Filed Dec. 16, 1920.]

KILLITS, J.: We have before us the stipulation of counsel for the parties to this cause, asking that the uncondensed record be allowed to go to the appellate court. We are of the opinion that the essential flavor of the testimony would be lost in condensation, that both sides will suffer materially in an attempt to strictly comply with the rule, and that the rule should be liberally construed in this particular instance, aside from the fact that the condensation would involve a large amount of labor and delays and would entail upon the trial court unusual difficulties in settling contentions respecting accurate condensation. We believe that the only fair way to get this case to a reviewing court is to allow the essential portions of the testimony to

80 go up as it was offered to the trial court, and that the only condensation which would safeguard the interests of both parties would be that only which would omit the mere formal parts of the testimony. It seems unnecessary to go even this far as the parties already have the testimony in printed convenient form.

December 16, 1920. John M. Killits, District Judge.

#### **Order that Record be Not Reduced to Narrative Form.**

[Filed Dec. 16, 1920.]

On reading of the petition of counsel for plaintiff and counsel for defendant in the above entitled cause for authority to use as a part of the transcript on appeal, without reprinting or reducing to an abbreviated or narrative form, those portions of the record in the above entitled cause which have been printed for use in the District Court,

and consideration of the contents of the printed record filed in this court and the statement of counsel for both parties filed with the petition, pursuant to Rule 15 of the United States Circuit Court of Appeals for the Sixth Circuit, and General Equity Rule No. 75, authority is hereby granted to use those portions of the record in this cause which have been printed for use in the District Court, as a part of the transcript on appeal, without reprinting or reducing to an abbreviated or narrative form the testimony therein. John M. Killits, District Judge.

**Stipulation in Refiling Printed Records.**

[Filed Jan. 25, 1921.]

It is hereby stipulated by and between counsel for the respective parties, that a complete printed copy of plaintiff's record as used in this Court, and a complete printed copy of defendant's record, may be filed with the Clerk of said Court and become a part of record on appeal.

It is further stipulated that the opinions, decrees and orders referred to in plaintiff's bill, as annexed thereto and printed with plaintiff's bill of complaint as a part of the record of this Court, may for all purposes be taken and considered as if certified copies of said decrees, orders, etc., were physically annexed to said bill of complaint.

It is further stipulated that the "answer" referred to in the præcipe for appeal shall be construed as the amended answer, as filed by defendant and as by previous stipulation substituted therefor. Stevenson, Carpenter, Butzel & Backus, Attorneys for Plaintiff. Barthel Flanders & Barthel, Attorneys for Defendant. Dated January 21, 1921.

**Præcipe.**

[Filed Dec. 17, 1920.]

The plaintiff-appellant indicates the following as the portions of the record to be incorporated in the record on the transcript on appeal:

Bill of complaint;

Answer;

All stipulations contained in the printed record as used in this court;

All testimony contained in the printed record as used in this court in the exact words of the witnesses;

Copies of patents and exhibits contained in the printed record as used in this court;

Opinion of the court;

Final decree;

Petition on appeal;

Assignment of errors;

Recital of deposit in lieu of bond on appeal;

Petition as to transcript on appeal;

Præcipe.

The plaintiff-appellant requests that all the original exhibits be forwarded to the Court of Appeals. Stevenson, Carpenter, Butzel & Backus, J. L. Stackpole, Counsel for Plaintiff-Appellant.

Agreed to. Melville Church, Counsel for Defendant-Appellee.

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### Amended Præcipe.

[Filed Feb. 4th, 1921.]

The plaintiff-appellant indicates the following as the portions of the record to be incorporated in the record on the transcript on appeal:

Bill of complaint;

Amended answer;

Stipulation as to amended answer;

All stipulations contained in the printed record as used in this court;

All testimony contained in the printed record as used in this court in the exact words of the witnesses;

Copies of patents and exhibits contained in the printed record as used in this court;

Memorandum opinion of the court;

Final decree;

Petition on appeal;

Assignments of error;

Opinion of the court on petition not to reduce testimony to narrative form;

Order allowing appeal and cash deposit in lieu of bond.

Petition as to transcript on appeal;

Stipulation as to filing of printed record used in District Court;

Order extending the time for docketing of appeal.

Amended præcipe;

Order extending time for docketing appeal.

The plaintiff-appellant requests that all the original exhibits be forwarded to the Court of Appeals. Stevenson, Carpenter, Butzel & Backus, Solicitors for Plaintiff-Appellant.

Agreed to. Barthel, Flanders & Barthel, Solicitors for Defendant-Appellee.

84 &amp; 85

### Order Extending Time to File and Docket Printed Record on Appeal to Feb. 15, 1921.

[Entered Jan. 15, 1921.]

Upon the application of the Clerk of this Court, for cause shown it is by the Court now here ordered that the time in which to file and docket printed record on appeal in this cause, be and the same is



hereby extended to and including the fifteenth day of February, A. D. 1921. Arthur J. Tuttle, United States District Judge.

**Order Extending Time to File and Docket Printed Record on Appeal to March 15, 1921.**

[Entered Jan. 25, 1921.]

Upon the application of the Clerk of this Court, for cause shown, it is by the Court now here ordered that the time in which to file and docket printed record on appeal in this cause, be and the same is hereby extended to and including the 15th day of March, A. D. 1921. Arthur J. Tuttle, United States District Judge.

A true copy. Attest: Arthur B. Mussman, Clerk U. S. Circuit Court of Appeals for the Sixth Circuit.

86      NOTE.—The first 27 pages of this volume are reprinted in Volume I. Otherwise this volume is the same as used in Argument in the District Court.

**Stipulation in Refiling Printed Records.**

[Filed Jan. 25, 1921.]

It is hereby stipulated by and between counsel for the respective parties, that a complete printed copy of plaintiff's record as used in this Court, and a complete printed copy of defendant's record, may be filed with the Clerk of said Court and become a part of record on appeal.

It is further stipulated that the opinions, decrees and orders referred to in plaintiff's bill, as annexed thereto and printed with plaintiff's bill of complaint as a part of the record of this Court, may for all purposes be taken and considered as if certified copies of said decrees, orders, etc., were physically annexed to said bill of complaint.

It is further stipulated that the "answer" referred to in the precept for appeal shall be construed as the amended answer, as filed by defendant and as by previous stipulation substituted therefor. Stevenson, Carpenter, Butzel & Backus, Attorneys for Plaintiff. Barthel, Flanders & Barthel, Attorneys for Defendant. Dated January 21, 1921.

87 District Court of the United States, Eastern District of Michigan, Southern Division.

In Equity.

THOMSON SPOT WELDER COMPANY, Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

On Harmatta Patent No. 1,046,066.

Evidence for the plaintiff taken under the Revised Statutes of the United States and the Equity Rules of the Supreme Court by agreement of counsel. Before me, Harrison F. Lyman, Notary Public.

Met pursuant to agreement of counsel at the office of Fish, Richardson & Neave, 84 State Street, Boston, Mass., at 10 a. m., March 6, 1918.

Present: J. L. Stackpole, Esq., of Counsel for Plaintiff.

Counsel for plaintiff offers in evidence a certified copy of the certificate of incorporation of the Electric Welder Company, dated November 22, 1916, and the same is marked "Plaintiff's Exhibit No. 3, Copy of Certificate of Incorporation of Electric Welder Co.

Plaintiff's counsel offers in evidence a certified copy of the change in name of the Electric Welder Company to the Thomson Spot Welder Company, dated December 18, 1916, and the same is marked "Plaintiff's Exhibit No. 4, Certificate of Change in Name of Electric Welder Company to Thomson Spot Welder Company."

Plaintiff offers in evidence a printed Patent Office copy of the United States Letters Patent No. 1,046,066, granted December 3, 1912, to the Thomson Electric Welding Company of Lynn, Mass., a corporation of Massachusetts, on the application of Johann Harmatta of Szepesvaralja, Austria-Hungary, and the same is marked "Plaintiff's Exhibit No. 5, Harmatta Patent in Suit."

It being agreed by the counsel for the respective parties that copies of the title papers of said Harmatta patent may be offered and used in evidence with the same force and effect as the originals, and that the defendant's counsel waives the proof of the signatures on said title papers, plaintiff's counsel offers in evidence as one exhibit a copy of an agreement between the Universal Elec-



tric Welding Company and the Thomson Electric Welding Company, dated June 17, 1909; a copy of an agreement between the Thomson Electric Welding Company and the Electric Welder Company, dated November 22, 1916; and a copy of an agreement between the Universal Electric Welding Company and the Electric Welder Company, dated November 22, 1916, and the same are marked "Plaintiff's Exhibit No. 6, Title Papers of Harmatta Patent in Suit".

JAMES H. GRAVELL, having been duly sworn, deposes and says as follows:—

Direct Examination.

By MR. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation.

A. My name is James H. Gravell; my age is thirty-seven; my residence is 129 Columbia Heights, Brooklyn, N. Y.; my occupation is consulting engineer in electric welding and metal working processes.

Q. 2. What experience have you had in the practice of electric welding and to what extent have you studied its principles?

A. My first experience in electric welding was in 1896, when I welded the abutting ends of fine wire with a battery.

In 1898 I was graduated from the Manual Training School of Philadelphia, Penn., and entered the employ of the Electric Storage Battery Company of Philadelphia, where I assisted in arc welding sheet lead.

Later in the same year I became associated with the Elwood Ivins Tube Company of Philadelphia and developed a method of welding the seams of umbrella rods. The development, however, was cut short by the failure of the company.

In the early part of 1901 I designed and installed a butt welding outfit for welding the abutting ends of automobile rims at the American Tube & Stamping Company in Bridgeport, Conn. The installation was highly successful. The following year I designed and built a second machine to take care of the increased output. I also designed and built a machine for electrically welding the abutting edges of the seams of tubes.

In 1902 I came back to Philadelphia and established an office at

1003 Drexel Building. During the next three years I installed arc welding at the Baldwin Locomotive Works, Philadelphia, Pa., and at the Sea Board Steel Casting Company, Chester, Pa.

In 1908 I entered the employ of the Philadelphia Electric Company and continued the development of my arc welding process which I had covered by patent. While with that company I made an exhaustive study of the design and construction of transformers.

The Hale & Kilburn Company of Philadelphia made me an offer in the early part of 1910, and I left the Philadelphia Electric Company and entered their employment as "Engineer on Electric Welding". During my employment I made a two years' study of the properties of the welding circuit.

Up to this time my methods of designing welding apparatus had been based on the calculations of electrical apparatus as applied to the design of lighting transformers, dynamos and motors, as taught in the various colleges and contained in the various text books. I then decided to investigate the theory of the subject along original lines. In my investigations I was assisted by my cousin, William H. Gravell, who helped me materially in the difficult mathematics of the subject. He was an expert mathematician.

We found that my calculations for butt welding were fairly correct, but were of no value in calculating the welding circuit for spot welding, especially when carrying out the process with pointed electrodes. This was for two reasons: first, the current used for spot welding was comparatively large and many factors which could be neglected in the ordinary lighting circuit became important in spot welding; and second, the heat losses in spot welding had to be treated very differently from those in an ordinary circuit.

The investigation, which was thorough and occupied fully two years, went into the subject from both the theoretical and practical sides.

I developed many spot welding operations for the Hale & Kilburn Company and designed and built many welding machines, many of which were used for spot welding automobile parts and the interior finish of cars. Many of the processes and machines were strictly new and I covered them with patents.

On leaving the Hale & Kilburn Company the latter part of 1914, I established an office at 1126 South Eleventh Street, Philadelphia,

Pa., and devoted myself to consulting work, a large part of which was connected with electric welding.

Q. 3. Explain the process described in the Harmatta patent in suit.

A. The object of the Harmatta process is to provide an electrical method for replacing the well-known riveting operation.

The process is intended to be used on superimposed metal sheets to replace riveting, without changing the work in any way, with the exception of omitting the rivet holes and the rivets.

The sheets to be processed, according to Harmatta, are lapped or placed one on top of the other (the same as in riveting), and are assembled in the exact relation to each other which they are intended to hold in the finished product (the same as in riveting). See Fig. 1 of the Harmatta patent.

The superimposed sheets are placed between two opposed tools *a, b* (the same as in riveting) and the pressure is exerted by the tools towards the sheets (the same as in riveting).

Harmatta's work-engaging tools *a, b* differ, however, from the work-engaging tools used for riveting. Harmatta's tools consist of electrical conductors, which are the terminals of an electric circuit, and are so shaped that they bear on the superimposed thicknesses of sheet metal which constitute the work, over a small or restricted area; that is, his work-engaging terminals or electrodes *a, b* are tapered or pointed.

When the sheet metal is treated according to Harmatta, the sheets to be united are lapped or superimposed and pressed together between Harmatta's tools and a current of electricity is passed from one tool to the other through the work. That portion of the superimposed sheets between the tools is brought to a high temperature while it is confined on all sides by relatively cold metal. The high temperature softens the work at this place, but the heated soft metal being confined by the relatively cold metal cannot extrude.

The pressure exerted by the tools forces the softened metal of the sheets into intimate molecular contact and it coheres, that is, it welds. The current is then interrupted and the tools removed from the superimposed sheets. The heated spot cools almost instantly, due to the masses of cold metal surrounding it.

The weld produced between the superimposed parts to all intents

and purposes takes the place of a rivet. A second weld may be made at a remote place, or close to, or even overlapping the first weld.

The weld occurs only at the small isolated spot between the electrodes, which spot has been electrically heated and pressed, and owing to these characteristics it has become technically known as a "spot weld", a term which has been generally accepted as applying solely to a weld produced by Harmatta's process.

The heat marks of a completed weld show that the current has been confined to a restricted area as it passed through the work, the size of the restricted area being governed by the size of the work-engaging surface of the tools used; in other words, the work-engaging tools have concentrated the current and pressure.

The process is very simple and quick. It entirely dispenses with clamps and rolls and is commercially very inexpensive, as no preparation for the work is required and no dressing or finishing of the weld is necessary after the welding has been completed.

The principal characteristics of the Harmatta process are:

1. The superimposed sheets being welded do not move in relation to each other during the welding operation;
2. The current for welding is concentrated by the electrodes;
3. The pressure for welding is concentrated by the electrodes;
4. The metal heated for welding is confined by relatively cold metal; and
5. There is no extruded metal.

Q. 4. To what uses is the spot welding process of the Harmatta patent applicable in the commercial arts, and to what extent has it been applied?

A. The spot welding process as described by Harmatta has been of great commercial value, as it is not only cheaper and stronger than riveting, but it can be used where riveting is costly and objectionable. An example of this is the interior finish of steel railroad cars. When rivets are used the constant vibration of the car causes the painted finish to crack around the rivet. This does not happen when spot welding is used.

There is hardly a sheet metal industry in which spot welding cannot be advantageously applied. The range of spot welding can be well appreciated when we see that it is used not only on large work



like railroad cars and motor trucks, but also on such small articles as the small metal signals used in card index files.

The interior steel finish of buildings, automobile bodies and parts, cooking utensils, stoves and furniture are being spot welded every day in large quantities.

My profession has enabled me to visit many of the metal working plants throughout the country and I therefore know the wide extent to which the spot welding process has been applied. No shop is too small to have its spot welding machine and in some small shops the spot welding machine is practically the only machine tool which they possess.

Spot welding has been the greatest improvement in electric welding since its conception by Professor Thomson and at the present time is used much more than Thomson's butt welding process. In many factories spot welding is used when butt welding is unknown.

The introduction of spot welding gave new life to the electric welding industry and its use is constantly increasing.

Q. 5. Please compare the process practiced by the Ford Motor Company as disclosed by the defendant's answers to the plaintiff's interrogatories with the process described in the Harmatta patent and the product of the defendant's process with the product of the process of the Harmatta patent.

A. According to the defendant's answers to the plaintiff's interrogatories, the Ford Motor Company is using machines one of which is illustrated in the picture Exhibit No. 1. These machines are used to produce welds such as occur in the automobile part which constitutes Exhibit No. 2.

These machines consist of extending arms or brackets the extremities of which are provided with work-engaging, tapered electrodes of good electrical conductivity. These electrodes are mechanically arranged to be moved toward and away from each other and constitute the terminals of a welding transformer, the primary of which contains an operating switch.

These machines are used for welding two or more superimposed thicknesses of metal constituting the work, by pressing the work together between the pointed electrodes, passing current from one of the electrodes to the other through the work while it is being pressed between the electrodes.

After the weld is completed, the current is interrupted and the welded work removed from between the electrodes. An example of the product of the process is shown in Exhibit No. 2 illustrating how the process is repeated a number of times on the same article to produce a number of welds.

The exhibit shows a number of isolated welds, which are technically known as "spot welds".

It is evident that the metal heated for welding has been confined by relatively cold metal and that no extruded metal has occurred. (In one case the metal from the weld has extruded, but this is a defective weld.)

It is also clear from Exhibit No. 2 that the superimposed thicknesses of metal did not move in relation to each other during the process, for prior to the processing these parts were placed in close overlapping contact and could not possibly move. This is especially clear when we consider that after the first weld was made the two parts were locked together.

The answers to the interrogatories considered in connection with Exhibits Nos. 1 and 2 clearly describe the same process as is described in Harmatta's specification.

In both cases pointed electrodes concentrate the current and the pressure which are applied to the superimposed thicknesses of metal which constitute the work, the weld occurs in the work between the electrodes and is restricted to the spot where the current and pressure are concentrated. During the welding process the superimposed parts do not move in relation to each other, the metal heated for welding is confined by relatively cold metal and no extruded metal is produced.

I know of my own knowledge that the answers to the interrogatories are correct and that the Harmatta process is used at the Detroit plant of the Ford Motor Company, for on January 9, 1918, I visited the Ford plant and saw machines arranged to carry out the Harmatta process shown in Exhibit No. 1, and I personally operated one of these machines and found that it produced a spot weld according to Harmatta's process. The specimen which I welded I here produce.

(Plaintiff's counsel offers in evidence the specimen produced by the witness, and the same is marked "Plaintiff's Exhibit No. 7, Gravell Specimen of Ford Welding".)

Boston, April 16, 1918, 10 A. M.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, Esq., Counsel for Plaintiff;

MELVILLE CHURCH, Esq., Counsel for Defendant.

By agreement the direct examination of Mr. Gravell is resumed.

Q. 6. Please examine the metal tube, Plaintiff's Exhibit No. 2, attached to plaintiff's interrogatories, and state what you find to be the characteristics of the welds appearing in that exhibit.

A. The superimposed portions of this tube contain welds which join the parts together. These welds are isolated spot welds; that is, small welds surrounded by unwelded areas. The metal directly over the welds has been substantially unaltered by the welding operation.

Plaintiff's counsel offers in evidence the plaintiff's interrogatories and the defendant's answers thereto.

Cross Examination.

By Mr. CHURCH.

X-Q. 7. Mr. Gravell, are you now connected with any concern or corporation as an officer or employee?

A. I am connected with the Tilghman Brooksbank Sand Blast Company as vice-president, and also connected with the American Chemical Paint Company as president and consulting engineer. These companies are located at 1126 South Eleventh Street, Philadelphia, Pennsylvania. The American Chemical Paint Company is a corporation of Delaware, and the Tilghman Brooksbank Sand Blast Company of New Jersey.

X-Q. 8. How long have you been connected with these two corporations respectively?

A. My connection with both companies dates from about the latter part of the year 1914.

X-Q. 9. How long have you been retained by the plaintiff herein, Thomson Spot Welder Company, or its predecessor-in-name, the Electric Welder Company, or its predecessor-in-title, Thomson Electric Welding Company?

A. I am not now retained directly by the Thomson Company, but have been retained since approximately last June by Townsend

& Decker, located at 149 Broadway, New York, as consulting engineer.

×-Q. 10. When did you first begin to assist Townsend & Decker in connection with electric welding?

A. Townsend & Decker called one day for my services, which were of a temporary nature, in connection with the DeFerranti interference, which was some time prior to the time at which I was definitely retained.

×-Q. 11. Were you first consulted by Townsend & Decker after the declaration of the DeFerranti interference, by which I assume you mean the interference that is now pending between an application of DeFerranti and the Harmatta patent here in suit?

A. It was after the declaration I was consulted.

×-Q. 12. Are we to understand, then, that you were not consulted by Townsend & Decker nor by the Thomson Spot Welder Company, or its predecessor-in-title, Thomson Electric Welding Company, prior to the declaration of the DeFerranti-Harmatta interference?

A. I understand from the testimony in behalf of Sebastian DeFerranti that this interference was declared October 2, 1913, and can answer the question by saying that up to that date I had never been consulted by the Thomson Company or any of its predecessors or connections. Neither had I been consulted by Townsend & Decker up to that time.

×-Q. 13. When in your direct examination in this case you testified that "spot welding has been the greatest improvement in electric welding since its conception by Prof. Thomson" you were referring to Prof. Elihu Thomson of Lynn, Massachusetts, were you not?

A. Yes, I was referring to Prof. Elihu Thomson.

×-Q. 14. What was the conception of Prof. Thomson that you had in mind when you made this statement to which I have referred, and when approximately was that conception first made known to the world?

A. The conception I referred to was made known to the world by a series of patents issued to Prof. Thomson, starting with patent No. 347,140, dated August 10, 1886. Prof. Thomson's conception of electric welding consisted in passing current across the

abutting ends of two objects for the purpose of heating them, which on obtaining the proper temperature were forced together and caused to weld.

×-Q. 15. According to Prof. Thomson's conception, the abutting surfaces, which are the objects to be welded, were first pressed together, the welding current was then passed through the parts, and further pressure was applied to effect the welding, was it not?

A. This is substantially true.

×-Q. 16. What was the nature of the current employed according to Prof. Thomson's conception?

A. In Prof. Thomson's form of welding a current of large volume was employed.

×-Q. 17. You mean large volume and low voltage?

A. Prof. Thomson was interested in securing a large volume of current, and it naturally followed that a small voltage was used.

×-Q. 18. What relation of amperage to voltage of current did Prof. Thomson suggest?

A. It is difficult to give generally the relation between the voltage and the amperage. The amperage must be sufficient to bring the abutting surfaces to a welding temperate and the voltage must be sufficient to produce the requisite current. The ordinary conception of Thomson's welding might be summed up in popular language in saying that currents of high amperage and low voltage were employed.

×-Q. 19. Currents with an amperage as high as 8 or 10,000 amperage and with a voltage of two or three volts might be employed in the practicing of Prof. Thomson's method, might they not?

A. That is true at the present day, but it is a question at the time we are speaking of, that is, the early days of electric welding, whether quite as large currents were employed.

×-Q. 20. What is this "greatest improvement in electric welding" which you would characterize a spot welding? Will you please define it?

A. Spot welding is that which has certain definite characteristics. Some of these characteristics are as follows: the current for welding is concentrated by the electrodes; the pressure for welding is concentrated by the electrodes; the spot heated for welding is

entirely surrounded by relatively cold metal; the parts being welded do not approach each other bodily; there is no extruded metal; the expansion due to the heated spot tends to force the parts being welded together. In explanation of this last characteristic, I will add that when metal is heated it expands, and as the metal which is heated for welding is entirely surrounded by relatively cold metal any expansion of the parts heated for welding tends to force the said parts heated for welding together. It is quite clear that in locating two bodies in close contact and surrounding them with cold metal that when these parts are heated they naturally expand, and as they have been confined they naturally press against each other.

×-Q. 21. Have you now explained what you deem to be the essential characteristics of spot welding? If not, and there is anything essential to be added, will you please state what it is?

A. I might add that the heat is generated within the parts to be welded, that no preparation of the material is required, and on completion the weld does not have to be dressed.

×-Q. 22. Now will you please state the essential characteristics of an apparatus by means of which, according to your notion, spot welding, so called, may be practiced?

A. The primary characteristics of an apparatus for spot welding must be a means for passing current from one terminal to another terminal, which are in contact with the work; at least one of the terminals must have a relatively small contact on the work. There must also be means for pressing the two terminals against the work. Commercially it is found advisable to have two copper terminals, one of which has been tapered or pointed, and these two terminals arranged directly in a line with each other, so that the parts of the work may be pressed together between these terminals. It is also necessary in a welding machine to provide means of supplying the proper current.

×-Q. 23. What is a proper current?

A. The proper current depends on the various qualities of the work, and on the time in which the welding is to be accomplished.

×-Q. 24. If the proposition is to unite two thin plates of metal, what is the necessary current that must be employed?

A. It would of course be a very inaccurate answer to state any

amount of current because you have not told me the thickness of the sheets and the time in which the welding is supposed to be done.

×-Q. 25. Is there no known law regulating the matter? If so, please state it.

A. The amount of current can be calculated or determined by a series of experiments. In order to calculate the amount of current, there is no simple law governing the matter, but the laws of resistance, the laws of conductivity of heat, and the laws governing specific heat enter into the calculation.

×-Q. 26. Am I to understand, then, that you cannot state the rule or law governing the matter inquired about? It would seem from your answer previously given that a cut and try method must be adopted.

A. Unless the problem was calculated, the determination of the proper current must depend on previous experiences.

×-Q. 27. But if you had no previous experience, then you must rely upon calculation, must you not?

A. By previous experience, I mean the experiment which preceded the securing of a satisfactory weld. This experience may be that of the experimenter or of experimenters preceding. I do not wish to be understood to mean that a person not being able to calculate, and having had no previous experience, would be unable to make a spot weld. This is especially true at the present time when machines are placed on the market all ready for the layman to operate on work within range of the machine.

×-Q. 28. How long has spot welding as you have defined it been known in this country?

A. I cannot answer that question broadly.

×-Q. 29. How long so far as your knowledge or information goes?

A. I have personally come in contact with spot welding since the year 1907, that is, my first actual contact with spot welding was about the year 1907.

×-Q. 30. Did you evolve spot welding from your inner consciousness, or was the idea of it communicated to you; and, if so, by whom, and under what circumstances?

A. As far as I can remember, the first time I heard of spot welding was after a lecture which I gave before an engineering society composed of the employees of Dodge & Day, Philadelphia, Pa.



This lecture referred to electric welding and Mr. Zimmerman, after my talk, mentioned that I had not referred to spot welding. Mr. Zimmerman was one of the officers of the company. On second thought I cannot absolutely fix the time as in 1907, but it was somewhere near that date, and can easily be determined through Mr. Kern Dodge or Mr. Zimmerman.

X-Q. 31. Now please tell us, as precisely as you can, what Mr. Zimmerman's communication to you was that gave you your first apprehension of spot welding, so called.

A. Mr. Zimmerman had been connected with the American Pulley Company, and he described the machines which did projection welding at that company, and in his talk he referred to the welds made thereby as spot welds.

X-Q. 32. Were they spot welds as you used the term in your direct examination?

A. The result of the operations at the Pulley Company were substantially the same as the process which I have described. The two processes, however, were different. I mention the Zimmerman affair as it was the first time I had heard the term "spot weld". In the case of the Pulley Company, projections were provided on one or both of the parts to be welded together, and the parts pressed together between two blunt dies. In the process which I have described as spot welding, no preparation of the material was required. The first time I came in contact with spot welding, as described by me, was at the Hale & Kilburn Company in 1910.

X-Q. 33. In 1910 was what you now call "spot welding" arrived at empirically by you, or did somebody communicate the idea to you?

A. While I was employed by the Hale & Kilburn Company in the early part of January, 1910, they had already been using spot welding for some little time.

X-Q. 34. Describe what they had been doing.

A. The Hale & Kilburn Company manufactured interior finish of steel cars and car seats, and it was on this class of work that they had been employing spot welding. In some cases they provided projections on their work, whereas in other cases pointed electrodes were used without any projections on the work at all.

X-Q. 35. Then it was from Hale & Kilburn that you first learned of spot welding. Am I right about this?

A. That is right; but having been to the factory of the Hale & Kilburn Company some months previous to my employment by them, I first saw spot welding in their plant at that time.

X-Q. 36. What do you mean by "spot welding" in your last answer?

A. By "spot welding" I mean welds made without any preparation of the material by pointed electrodes.

X-Q. 37. Do you draw a distinction between "spot" welding and "projection" welding? If so, what is the distinction?

A. There has been some confusion regarding the two methods which result in a similar product. I refer to the electrode method and the projection method. In the electrode method, the current is concentrated by the electrodes, the pressure is concentrated by the electrodes, the metal heated for welding is completely surrounded by relatively cold metal, the parts being welded do not move bodily towards each other, there is no extruded metal, no preparation of the work is required.

In the projection method the current is concentrated by means of a projection on the work. The pressure is also concentrated by the same projection. Owing to the projection preventing the contact of the plain surfaces of the work, which projection is mashed down in the operation, the parts being welded do move toward each other. The metal heated for welding, that is the projection, is not entirely surrounded by relatively cold metal. As the whole operation depends on the projection, the work necessarily must be prepared by providing this projection.

X-Q. 38. I show you copy of patent to Rietzel, No. 928,701, dated July 20, 1909, application filed February 24, 1905, and ask you whether that patent, with which I presume you are perfectly familiar, discloses a method of spot welding and an article produced by a spot welding method such as you have characterized as a spot welding method and a spot welded product in your direct examination, or is it an exposition of the projection method referred to in your answer to the last question?

A. Rietzel patent No. 928,701 shows a method and a product which I have described as "projection" welding in my last answer.

what had already been accomplished at the Hale & Kilburn Company previous to my employment by that company.

×-Q. 48. Then as a matter of fact the art of spot welding was an accomplished fact and in practical operation when you first became acquainted with it and such experiments as you and your cousin made were for the purpose of demonstrating how the results already accomplished had been accomplished. Am I not right about this?

A. The art of spot welding at the time of my employment with the Hale & Kilburn Company was developed to some little extent, but I understood from the Hale & Kilburn Company that very few others were using it at that time, and my investigation was to determine the general principles on which the results depended and to increase the scope of spot welding, so that it could be applied to much heavier work.

×-Q. 49. If I place two overlapped sheets of thin metal between opposite electrodes and then apply a pressure to one or both of the electrodes, so as to clamp the sheets firmly between them, and then pass a welding current of electricity through the electrodes and through the plates, while maintaining the pressure, will I have practiced spot welding as you understand it, although I have made but one weld?

A. That depends on whether the electrodes are the means of concentrating the current and pressure. If that is the case, you have made a spot weld.

×-Q. 50. Would this be so whether or not the contact faces of the electrodes, or one of them, are of smaller area than the area of the sheets or plates operated upon?

A. Generally stated, yes.

×-Q. 51. In order to practice spot welding, then, it is not necessary that the articles to be welded are united at more than one spot. Is that correct?

A. One spot is sufficient to show an example of spot welding.

×-Q. 52. Suppose the electrodes were applied only at the edges of overlapped plates, so as to extend clear to margins thereof; is that spot welding?

A. It is spot welding in so far as the characteristics of this proposition agrees with the characteristics of spot welding as I have

noted in my previous answers. From the spot welding standpoint, it may be termed a "defective" spot weld, the same as riveting together at the extreme edges would be called a defective rivet.

X-Q. 53. Suppose that two strips of thin metal two inches wide have their ends overlapped to the extent of one inch, and that the electrodes employed to unite these overlapped parts have each a contact surface of one-quarter of an inch in area, and that these electrodes are applied once only to the overlapped ends, so as to make one weld of approximately one-quarter of an inch in area at the very middle of said overlapped portion; would that be spot welding?

A. Yes.

X-Q. 54. In the case last supposed imagine two welds to be made, viz., one extending to the extreme lateral edge of the overlapped portion at one side, and the other to the extreme lateral edges of the overlapped portions at the other; would that be spot welding?

Mr. STACKPOLE. This line of questions relating to hypothetical propositions is objected to as hypothetical and indefinite and outside the scope of the direct examination.

A. In so far as these welds agree with the characteristics which I have enumerated as spot welding, they are spot welds.

X-Q. 55. Still adhering to our supposed case, assume that the first weld were made at the extreme lateral edge of the overlapped bands at one side edge, that the second weld was made so as to overlap the first, and the third so as overlap the second, and so on across the bands to the opposite edge; would that be spot welding?

A. According to my judgment each weld at the time it was made would be a spot weld.

X-Q. 56. Suppose now that the two overlapped bands of thin metal are operated upon by two narrow electrodes, and extend way across the bands from side to side, so as to in operation make one continuous weld extending from side to side; would that be spot welding?

A. I do not believe that an effort to make such a weld would be commercially successful, and I must answer the question by saying

that were such a thing possible it would be a spot weld in so far as it agrees with the characteristics which I have mentioned.

×-Q. 57. In spot welding must the resistance of the electrodes be less than that of the interposed plates to be welded?

A. Theoretically, no; but practically, yes.

×-Q. 58. What happens if the resistance of the electrodes is greater than that of the interposed plates?

A. I understand from this question that we are speaking of specific resistance of materials. Using a number of electrodes of different specific resistances, those of a high specific resistance will get hotter than those of a low specific resistance. In case carbon electrodes are used of the size usually employed for copper electrodes, and using the same current as would have been used with the copper electrodes, the carbon electrodes will become highly heated.

×-Q. 59. If you would use electrodes of high resistance material such as carbon with which to spot weld, you would have to employ a current of greater voltage than that usually employed, wouldn't you?

A. The total voltage acting on the welding circuit would have to be increased in proportion to the increase in resistance, provided the same current is to be maintained through the welding circuit.

(Adjourned until 2 p. m.)

×-Q. 60. Does the Harmatta patent state of what substance the electrodes are to be composed?

A. According to my understanding of the Harmatta patent, it is implied that these electrodes are of a good conducting material. Harmatta refers to electric welding of a certain type in which it was customary at that time to make the clamping electrodes of copper. Harmatta does not distinctly mention that the electrodes should be of copper.

×-Q. 61. Can you give an instance in the prior art where clamping electrodes are said to be of copper?

A. I cannot recall any specific literature on that matter, but I personally have known of butt welding machines in use in the year 1900 the clamping jaws of which were of copper.

×-Q. 62. But those were machines in which the work itself was

held by the clamping jaws, as in the Thomson butt welding machine, were they not?

A. That is correct. I have been referring to a Thomson butt welding machine.

×-Q. 63. You know of no instance in the prior art, I take it, in which pressure electrodes intended to clamp metal plates for the purpose of welding them were made of copper?

A. Offhand, I do not know whether pressure electrodes of copper were employed, but this could readily be ascertained by examining the patents of the prior art.

×-Q. 64. Does the Harmatta patent specifically mention the metal of which the parts or plates to be united are composed?

A. From a quick examination of the patent I would say that the composition of these plates was not specified except in so far that Harmatta refers to cooking utensils, which are usually of steel or iron, and uses the term "electric welding", which was most usually practiced on steel or iron.

×-Q. 65. Is the method of the Harmatta patent limited to the uniting of plates of any particular thickness?

A. Without trying to interpret Harmatta's patent, it is my judgment that it is not limited as to any specific thickness of material.

×-Q. 66. The two plates shown in Fig. 1 of the patent are apparently of the same thickness. Do you find anything in the patent indicating plates of different thicknesses were proposed to be united?

A. I cannot remember any specific instructions in the Harmatta patent regarding the welding of plates of different thicknesses, but as it is often customary in kitchen utensils to have some of the parts thicker than other parts, I should suppose that Harmatta realized that the metals would not have to be of the same thickness.

×-Q. 67. Does the patent give any instructions as to the voltage or amperage of the current to be employed?

A. Only in so far as he refers to what he means by electric welding, where it was customary to have large currents and low voltages.

×-Q. 68. Does the patent indicate how the current employed is to be produced?

A. Only so far as his term "electric welding" applies.

spot welded is limited owing to our inability to apply the requisite pressure and the required current.

×-Q. 81. Would not the internal resistance of the plates themselves to the passage of the current depend both upon the thickness of the plates and the materials of which the plates were composed?

A. In one sense this is correct, but resistance depends on three dimensions: area and length, and is not entirely governed by the two factors which you mentioned.

×-Q. 82. Can you spot weld a thin plate of copper to a thin plate of iron?

A. I have never seen this done by the electrode method of spot welding.

×-Q. 83. What is your opinion as to whether or not it may be done?

A. I would say that it is possible, but I have had no experience in welding these two materials by spot welding.

×-Q. 84. May two thin plates of copper be spot welded?

A. I consider it possible to weld copper together, although it is rather difficult.

×-Q. 85. Would not the intimacy of contact between electrodes and plates in spot welding affect the generation of heat at those points?

A. By intimacy of contact I understand you to mean a larger contact, because, electrically speaking, either the parts are in contact or not in contact. If a very large current were passed through a small contact, there would be more heat generated than if a small current was passed through a large contact.

×-Q. 86. Would the amount of pressure of the electrodes on the plates affect the generation of heat between the electrodes and plates, the impressed current being constant?

A. Up to a certain point, yes.

×-Q. 87. And I suppose the material of which the electrodes are composed would affect the generation of heat between the electrodes and plates, would it not, — electrodes of lower conductivity and higher resistivity producing more heat at the points between the electrodes and plates?

A. I cannot say definite regarding this because it so happened that the poorer conductors of electricity are also poorer conductors



of heat, and it may be that although the same amount of heat might be generated, still the temperature would be greater in the case of the poor electrical conductor, because less heat would be conducted away from that point.

×-Q. 88. According to the Harmatta patent are any limitations at all placed upon the characteristic of the electrodes employed?

A. According to my understanding of Harmatta's patent, he proposes a copper electrode would be employed, but so far as I can remember he does not go into the matter of electrodes.

×-Q. 89. I ask you to quote the language to which you refer.

A. Harmatta tells us that his process relates to "a novel method of fastening the component parts by the process of electric welding". He then goes on to define his term of electric welding, and states that he means "that well known process in which the work is brought to the welding temperature by the internal heat generated by the resistance of the work itself to the passage of the electric current at the place of contact between the parts to be joined by the welding pressure". Anyone being familiar with the prior art in which copper electrodes were employed would, I believe, assume that Harmatta's electrodes were made of the same material as was the common practice at that time.

×-Q. 90. Have you now pointed out all the passages in the patent that in your opinion indicate that Harmatta proposed to use copper electrodes? If not, I wish you would point out any other passage or passages that you may find supportive of your view.

A. The use of the word "electrode" to represent the tools which are pressed on the work would, to my mind, impress anyone skilled in the art at the time of Harmatta's application with the idea of copper electrodes, as the electrodes used in the art were at that time composed of copper or an alloy rich in copper.

×-Q. 91. You are again referring to electrodes used in clamping the work, such as are referred to in the Thomson butt welding process?

A. Yes, that is true.

×-Q. 92. In spot welding if electrodes of the same or higher resistance than that of the interposed plates are employed, will not welding take place between the plates if the current is led into and through them notwithstanding the heating of the electrodes?

A. Yes, this will produce a weld between the two plates, provided, however, the electrodes are not too hot and actually melt through the plates before the plates have had a chance to get internally heated.

X-Q. 93. In spot welding there is always a good deal of heating of the electrodes, is there not?

A. There is always a great tendency of the electrodes to heat, but the electrodes are not allowed to attain a high temperature. A cooling system is usually provided to take care of this.

X-Q. 94. But cooling of the electrodes would not be necessary but for the quick successive uses of the apparatus, would it be?

A. That is quite true, because the electrodes are relatively massive and the heat conducted away from the work is dispersed throughout the mass so that in ordinary spot welding one weld will not raise the electrodes to a very high temperature.

X-Q. 95. Is there any indication in the Harmatta patent that cooling of the electrodes is to be resorted to in any case?

A. Only in so far as he explains that his process is connected with Thomson's electric welding, in which case it was customary to cool the copper electrodes.

X-Q. 96. Can you say that in spot welding the heat of the electrodes, due to their contact with the plates, does not contribute to the welding of the interposed plates?

A. I think it can be safely said that the heat of the electrodes commercially used in spot welding do not influence the welding of the work, as can be readily seen from the automatic machines now on the market, where no adjustment is required for making the first weld with the electrodes cold and making the weld after the electrodes have become heated.

X-Q. 97. Isn't it true that as copper electrodes become heated in a spot welding machine their conductivity decreases and the resistivity increases?

A. This is theoretically true, but the electrodes in a commercial machine, due to their water circulation, are never allowed to get sufficiently heated to make any practical difference in their resistance. It is certainly true that the resistance of the electrodes does increase with an elevation in temperature, but as this temperature

is never allowed to run very high, the increase in resistance is of no practical difficulty.

×-Q. 98. Even though the electrodes of copper become very highly heated, you can still spot weld with them, can't you?

A. So long as the copper electrodes withstand the pressure required for the welding, they can be used for spot welding irrespective of their temperature. It is plain, however, that as the temperature of the electrodes rises the metal becomes less and less able to hold its shape under the welding pressure.

×-Q. 99. In an ordinary spot welding machine you can weld red hot plates, can't you?

A. Yes, provided the plates have not been allowed to oxidize to such an extent that the electricity will not flow through them.

×-Q. 100. If the resistance of the electrodes is higher or lower than that of the plates acted upon, or the same as that of the plates, is not the heating of the electrodes inevitable?

A. Owing to the fact that the electrodes are in contact with the heated metal and are colder than the heated metal, there is always a flow of heat from the heated metal to the cold electrodes, and unless the electrodes are cooled by some means, or radiate their heat, they will, of course, get hot.

×-Q. 101. In spot welding is there only one substance that will answer for electrodes? If not, what other substances will answer?

A. From a practical standpoint, copper is the only substance known to me which is satisfactory for spot welding.

×-Q. 102. Have you ever tried any other material for electrodes beside copper?

A. Yes; I have tried bronze.

×-Q. 103. Anything else?

A. I believe that is all.

×-Q. 104. Could you spot weld with carbon electrodes, if you employed a proper current?

A. I do not believe it would be practical to use carbon for electrodes for the electrode-spot welding of which you are speaking.

×-Q. 105. Why not?

A. It is quite probable that they would attain such a high temperature they would burn out the same way that a carbon filament in a lamp burns out when too much current is applied.

×-Q. 106. How about carbon coated with metal? Wouldn't electrodes of that material answer? If not, why not?

A. I believe that it would be very difficult to maintain a pointed electrode where the point consists simply of carbon, which would be the case where a rod of carbon of substantial size was enclosed in a tube of copper.

×-Q. 107. Suppose you were to take electrodes of the size and form suggested by the Harmatta patent and make them of carbon coated with metal, could you spot weld with them?

A. If the entire electrode was covered with copper of sufficient thickness to carry the current, the core of carbon would have no influence on the electrode. I assume that the electrodes are entirely covered with copper, even the parts in contact with the work. Electrodes of this nature would to all intents and purposes be copper electrodes and could be used for spot welding.

×-Q. 108. Could you spot weld with electrodes composed of steel; and, if not, why not?

A. Commercially speaking, no, because steel electrodes stick to the work.

×-Q. 109. Have you ever tried that? Or is that an assumption on your part?

A. I have never tried to commercially spot weld with steel electrodes.

×-Q. 110. Have you ever tried to spot weld with them at all, commercially or otherwise?

A. No, I have never tried to spot weld with steel electrodes.

×-Q. 111. The metal tungsten has a relatively high conductivity and low resistivity, has it not?

A. Tungsten is a poor conductor compared with copper.

×-Q. 112. It is a good conductor compared to carbon, is it not?

A. It is a better conductor of electricity than carbon, but off-hand I do not remember its exact relation.

×-Q. 113. Could you spot weld with electrodes made of tungsten?

A. I believe there is a process based on the use of tungsten in which copper is welded.

×-Q. 114. Spot welded?

A. I believe it could be called spot welding.

×-Q. 115. Iridium is of higher conductivity and lower resistivity than iron, is it not?

A. I am not familiar with iridium.

×-Q. 116. Then you do not know whether electrodes made of iridium could be used for spot welding. Is that a fact?

A. I cannot answer regarding iridium.

×-Q. 117. You cannot say whether iridium would answer or not?

A. I am not familiar with the problems of iridium.

×-Q. 118. Assuming that in spot welding the electrodes are placed firmly against the superimposed plates with no current on and that then, while the pressure continues to be applied, current is turned on and maintained until a proper welding of the plates has been effected, and that the current and pressure are then removed, will not the aggregate thickness of the plates at the point of pressure and welding be less after the completion of the weld than before?

A. There is a slight depression at the weld which would make the aggregate thickness slightly less.

×-Q. 119. I take it that very slight decrease in thickness is due to the heat and pressure involved in the welding operation. Is that not so?

A. Yes.

×-Q. 120. What has become of that displaced metal which the heat and pressure have displaced?

A. Sometimes there is a noticeable upset around the tool which has created the pressure. The amount of depression is usually so slight that it is very difficult to say what becomes of the metal. The condition is very similar to pressing any piece of metal with a blunt tool; either the metal must be upset or condensed.

×-Q. 121. In ordinary spot welding is the metal softer at the contact point between plates than it is at the point of contact between the electrodes and plates?

A. In all probability, while the metal is in the hot condition the greatest heat is at the centre of the plain surface which is in the process of welding, because heat is continually flowing from this hot place to the surrounding metal, which is relatively cold. As the degree of softness is a function of the temperature, it naturally follows that the softest part of the metal would be located on the

surfaces of the sheets between the sheets at the centre of the heated spot.

×-Q. 122. And if there is any flowage of metal, due to compression, it ought to take place in the greatest degree where it is softest, that is to say, at the proximate faces of the plates, would it not?

A. This would be the case if the metal were not confined, but as the spot heated for welding is entirely surrounded by relatively cold metal, we can hardly think of the metal as flowing out or moving, except in so far as it is pressed strongly against itself, owing to the expansion due to the heating.

(Adjourned to Wednesday, April 24, 1918, at 10.00 A. M.)

BOSTON, MASS., May 6, 2.00 P. M.

Met pursuant by adjournment.

Counsel present as before.

*Cross Examination of Mr. Church continued.*

×-Q. 123. In spot welding is not a flat counter electrode sometimes used larger than the opposing electrode to prevent indentation and keep the work smooth on the side next the flat counter electrode?

A. The flat electrode you refer to is really used for convenience, to a great extent, that is, only one of the electrodes has to be maintained pointed. It is also true that if two very pointed electrodes be used in connection with excessive currents, there will be tool marks on both sides of the work; one of these marks can be to a very great extent, avoided by using a flat electrode on one side.

×-Q. 124. In spot welding how large an area may the contacting surface of the smaller electrode have?

A. This depends on a number of things, principally on the amount of current available and on the size of weld desired. In ordinary practice it is very customary, when welding sheet metal, to give a rounded surface to the so-called pointed electrode. This would theoretically make the tool bear at but a single mathematical point, but the tool soon wears, so that in ordinary spot welding work the tip of the pointed electrode usually assumes the size of about a quarter of an inch in diameter.

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X-Q. 125. You mean that the electrode has a bearing surface of about a quarter inch in diameter?

A. It is impossible to say what the bearing surface is at the start of the weld, as it is very difficult to make one piece of metal bear on another over an extended area, and although I meant in a previous answer the bearing surface was about a quarter of an inch in diameter, yet it is impossible to determine whether or not the total surface is in contact with the work at the start of the weld.

X-Q. 126. Would it be practicable to spot weld metal plates between electrodes having flat contact surfaces half an inch across?

A. I should think this would be possible provided sufficient current was forthcoming.

X-Q. 127. How about electrodes an inch across the contact surfaces?

A. I still believe this would be possible.

X-Q. 128. Is there any limit to the area of the contact surfaces of the electrodes with which spot welding may be accomplished? And, if so, please state it.

A. As long as we maintain the relative sizes of contact surface and current as implied by Harmatta's patent, I do not think there would be any definite limit to the size of the contact area of the electrodes, except those limits made by the current and pressure available.

X-Q. 129. What are the relative sizes of contact surface and current which you find implied in the Harmatta patent?

A. Harmatta speaks of sheet metal work similar to cooking utensils and speaks of his invention as replacing the rivets in such work. If we arrange our electrodes and our currents accordingly to obtain a weld which will replace these rivets, it will give us some idea of the size of the electrodes and the amount of current required, and therefore show us a certain relation between the size of the electrode and the amount of the current.

X-Q. 130. You find, however, no explicit statement in the Harmatta patent indicating what relation the size of the contact surface is to bear to the current, do you? If so, please point it out.

A. The only instructions Harmatta gives us is to experiment and obtain this data for ourselves.

X-Q. 131. It is apparently your view that the size of the opera-



tive contact faces of the electrodes in spot welding is not limited. I will now ask you whether in spot welding there is any limitation to the size of the spot welds produced?

A. I have not had an opportunity to go into this matter very extensively and can only give you what my opinion of the matter is. I should think theoretically that the size of the weld could be increased indefinitely, provided, however, the pressure and the amount of current could be secured so as to still hold the ratio which I have already mentioned.

×-Q. 132. Will you mention that ratio again, so that we may have a clear-cut expression from you on the subject?

A. As I have no notes I will give a ratio which may not be exact, but may be satisfactory for an answer. I should say that with the contacting face of one-eighth of an inch in diameter a current of 3,500 amperes would be required when welding sheets of about one thirty-second of an inch thick in two seconds.

×-Q. 133. What would be the voltage of this current?

A. I cannot answer that question offhand, but it would depend on the resistance of the metal between the electrodes.

×-Q. 134. A metal of higher resistance would require greater voltage?

A. Metal of higher resistance would require a greater voltage to force the current I have mentioned through the sheets. I have assumed in the answer to the previous question that the sheet steel was of the ordinary commercial quality. If the resistance of the sheets is increased, it in all probability would not require as much current as I have mentioned, and the same voltage on high resistance sheets would no doubt be sufficient to force enough current through the sheets to produce a weld.

×-Q. 135. Assuming that you are going to weld what you call sheets of sheet steel of ordinary commercial quality, using electrodes having a contact face of one-eighth of an inch in diameter with a current of 3,500 amperes, what would be the voltage required?

A. I cannot answer this question, not having any of my notes or other data with me. I might remark, however, that the voltage across the terminals of the electrodes would be very small, probably not over .3 volt. This is not an accurate statement, but merely my effort to answer your question.

×-Q. 136. If I understand you correctly, if sheets of higher resistance are attempted to be welded, the voltage of the current would have to be increased. Am I right?

A. No, you are not right. The voltage would have to be increased if you wanted to pass the same current through the sheets, but the added resistance of the sheets would generate more heat in the sheets and a current of lower amperage could be used for the spot weld, and the same voltage might be applicable in both cases.

×-Q. 137. You have not stated any definite law or rule which is to be followed in practicing spot welding as distinguished from other kinds of electric welding. Is there no such rule or law, or are you simply unable to state it?

A. There is no simple rule or law for calculating the current required in either spot welding or butt welding. For instance, we cannot state positively that a certain amount of current is required for a certain area to be welded. In butt welding considerable heat is lost by radiation owing to the fact that the parts heated for welding are exposed. In butt welding, also, no metal comes in contact with the parts heated for welding. In spot welding all the metal heated for welding is enclosed by relatively cold metal. This complete enclosure naturally conducts a large quantity of the energy away from the parts heated for welding. The problems of radiation can to a great extent be neglected in spot welding.

×-Q. 138. I didn't ask you if there was any simple rule or law regulating this matter, but if there was any rule or law at all, and to state it if you knew it. With this understanding, will you please answer the question?

A. The only rule or law which I know of in connection with problems of butt welding and spot welding is to calculate the losses of the energy supplied to the parts to be welded, then add sufficient energy to heat the work, in a given time, then knowing the resistance of the work, determine the amount of current required.

×-Q. 139. Does the Harmatta patent teach this rule or law which you have endeavored to formulate as the one which is to be followed in the practice of welding according to the patent?

A. In one way it does. It tells us that certain results can be obtained upon a certain class of work. The question naturally

arises in an experimenter's mind, cannot these results be obtained on thicker classes of work and on thinner classes of work, and once knowing that results can be obtained, it is the engineer's object to measure the various factors in the various classes of work to which the invention has been applied and to formulate his own methods of calculating ahead what results he may expect to obtain.

×-Q. 140. Will you read from the patent any passage or passages that you find there tending to support the statement you have just made?

A. I quote from the patent as follows:—

(Page 1, line 8:) "My invention relates to the manufacture of metal articles."

(Page 1, line 14:) "The invention affords a cheap and practical substitute for riveting."

(Page 1, line 17:) "It may be employed for the thinner sheet metal such for instance as is used for sheet metal wear like vessels or household utensils. In general terms the invention may be stated to consist in fastening the pieces together by an electric weld at one or more distinct or well-defined spots, each of small area or extent, in their juxtaposed or opposite plain faces by the application of pressure and heating current localized in such spots."

(Page 1, line 57:) "By the term 'electric welding' as used herein, I mean that well-known process in which the work is brought to the welding temperature by internal heat generated by the resistance of the work itself to the passage of an electric current at the place of contact between the parts to be joined by the welding pressure."

(Page 1, line 75:) "While it is possible consistently with my invention to localize the desired pressure and heating current at the desired distinct small spot or area in various ways, this may be accomplished conveniently by pressure applied over the spot and itself localized on the back of the plate or sheet immediately over the small spot in which the union is to be made by using a tool pressed against the work by its end and formed at such end so as to engage the work by a spot or area of small extent and serving likewise by preference as the electrode which feeds the current into the work to heat the same. The member which feeds the electricity being thus at the same time the tool, in this manner the most fav-

orable conditions of working possible are secured, since as is well known in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough."

(Page 2, line 7 :) "In the accompanying drawing, Fig. 1 illustrates the application of my invention to the welding of two plates or sheets overlapped so as to be superposed or have a portion only of their meeting faces presented to one another and by the welding of the opposed surfaces intermittently or at certain spots only through applying pressure at a point or spot on the back of a plate over the spot of desired union. Fig. 2 is a side elevation of a welding device also illustrated in part in Fig. 1. It shows the construction of the means which may be employed for pressing the electrode against the work by manual power. Figs. 3 and 4 show forms which may be adopted for the ends of the electrodes where they engage the work."

(Page 2, line 69 :) "The time of duration of pressure and heating and the amount of pressure as well as the volume of current for effecting the weld can be readily determined by experiment for different sizes of thicknesses of metal and is well understood in the art of electric welding to which my invention relates."

X-Q. 141. Have you now quoted all the passages that you find in the patent tending to support the statement made in your answer to X-Q. 139? If not, and there are any others, I wish you would also quote them.

A. I believe that had these passages been read to me they would have been sufficient to enable me to have secured the data which I have referred to in the above answer.

X-Q. 142. Now, suppose the passages you have quoted had not been made, the directions upon which you rely would have been absent; where would that have left you?

A. The remaining portion of the patent still has sprinkled through it references to the illustrations and to spot welding, and no doubt by the aid of the drawings I still would have been able to understand that Harmatta claimed to make a small weld by means of passing current from the electrode *a* to the electrode *b* through the opposed meeting surfaces of the sheets, as shown in Fig. No. 1.

I no doubt would have supposed that Harmatta's Fig. No. 1 represented the arrangement of his materials in correct proportions.

×-Q. 143. It is your idea, then, as I understand you, that it sufficed for Harmatta to state the result that he proposed to accomplish and that by cut and try methods anyone attempting to achieve that result might arrive at the proper material of which to form the tools or electrodes, the proper amperage and voltage of current to be employed, the proper proportioning of amperage and voltage of current to the resistance of the material acted upon, and to the area of contact surface of the electrodes, and to the time of making the proposed welds, all without any further direction from Harmatta. Do I state your position correctly?

A. As I understand you, you do not state my position correctly. I can only answer your question from my own standpoint, and that is, from one skilled in the art at the time of Harmatta's invention. Should I have been handed the result of Harmatta's process, that is, two sheets which had been spot welded together, and had not been told how the results had been accomplished, it is not likely that I could have imitated the product; but if I had been told they had been electrically spot welded together by the Thomson process by means of pointed electrodes placed directly over the parts being welded, I no doubt could have finally secured Harmatta's results.

×-Q. 144. After a sufficient period of experimentation you mean?

A. Of course it is impossible for me to say now whether the first sample would have been spot welded or not. Surely, if I knew the results were possible and the means for securing the results, it should not have taken long to obtain the results.

×-Q. 145. In so-called "butt welding", what is called "extrusion of metal" and what causes it?

A. Extrusion of metal is the forcing out or upsetting of the parts heated for welding. It is caused by the parts being welded being forced together. The extrusion of metal results is what is known as a "burr".

×-Q. 146. This extrusion of metal is caused by the displacement of the softened metal due to heat and pressure, is it not?

A. It is due to the pressure applied to the unconfined heated parts.

×-Q. 147. Does not this extrusion of metal also occur, though

in less degree perhaps, in spot welding under the heat and pressure to which the metal is subjected?

A. I cannot say that there is any extruded metal in spot welding. It must be understood that the metal heated for welding in spot welding is entirely confined by relatively cold metal.

X-Q. 148. Can you say that there is no extrusion of metal even in the slightest degree in the case of spot welding?

A. Generally stated, there is no extruded metal in spot welding when the currents are properly proportioned to the work. In some special cases I have noted when the work has not been properly performed a slight thickening of the sheets directly around the welding electrode. This thickening is rather unusual, and I have only noted it where the processes have been carried on in an incorrect manner.

X-Q. 149. Is there anything said in the Harmatta patent about the extrusion of metal, or any directions given by which extrusion of metal is avoided?

A. In the Harmatta patent, page 2, lines 83 to 91, would seem to indicate to me that there was no extruded metal, as the term "extruded metal" is understood in butt welding and the previous art.

X-Q. 150. Do you find anything else in the patent on this subject? If so, please point it out.

A. The only other reference which I know of at the present time is that (page 1, line 14) where Harmatta says that his invention is a cheap substitute for rivets. If there had been extruded metal which had to be removed after the welding process, the process could hardly be looked upon as a cheap process and a substitute for rivets, as the removing of the "burr" or extruded metal in butt welding is quite costly as compared with the actual welding process.

X-Q. 151. In welding, according to the Harmatta disclosure, are not the pieces to be welded forced together with a moderate pressure; is not the electric current then passed through the proposed joint or place of union for a sufficient time to raise the parts to a welding temperature at the portions abutting, and is not the pressure then increased to complete the weld?

A. I have seen very satisfactory welding done by this method,

and I have also seen very satisfactory spot welding done by maintaining a steady pressure on the work by means of a spring.

X-Q. 152. I shall have to repeat my question. Please give me a direct answer to it.

A. In answering your question I will say that spot welding can be done by the method you describe, but it is also possible to secure satisfactory spot welds by maintaining a constant pressure on the work by means of a spring or other means.

X-Q. 153. Does Harmatta suggest the use of a spring?

A. Harmatta tells us various means of applying pressure (page 1, line 98, to page 2, line 6). In one case he says the pressure may be applied by hand; in which case it is quite possible, and even probable, that a constant pressure would be applied to the operating mechanism acting for all intents and purposes as a spring, like many of the semi-automatic welders used for butt welding.

X-Q. 154. Does not the description of the practice of the Harmatta disclosure set forth in X-Q. 151 accurately describe the butt welding process of Thomson?

A. Yes, this is true, but at the time of Harmatta's invention there were many butt welding machines operating simply by means of weights or springs, which also would be a correct description of Thomson's process. The point I want to bring out is that your description is correct, but that other descriptions would also be correct.

X-Q. 155. Where there are two plates to be welded together, and one is placed upon a suitable support and has the current led to it at a point remote from the place of proposed weld, and the other is pressed firmly against the first plate by a current-carrying electrode applied over the place of proposed weld, is that spot welding in the sense of the Harmatta disclosure?

A. The large electrode which you speak of would be uniformly charged, irrespective of where the conductor was connected to it, and a spot weld, produced by means of this block and a pointed electrode, I would say, was spot welding, irrespective of the position where the conductor supplying the current to this block was located. I understood, from this question, that the support of which you speak was a conductor, and that the wire leading to it was connected to it at a place remote from the spot to be welded.



Assuming that the support is a non-conductor, and that the lower sheet is connected at some remote point with one of the electrodes, and a pointed electrode placed on the top of the other sheet, resulting in a weld between the two sheets under the pointed electrode, I would call this a spot weld.

×-Q. 156. It is not, then, necessary to employ two opposed electrodes, that are independent of the work, in order to spot weld. Am I right about this?

A. I assume, from your previous question, that welding was possible and I would call a weld produced by means of a process which has the characteristics of that which I have previously mentioned a spot weld. Provided the current and the pressure were localized at a spot, producing a weld at this spot, I would still call it a spot weld, irrespective of what other means than two oppositely opposed electrodes, directly over the weld, were employed.

×-Q. 157. What do you understand to be the form of electrode shown in Fig. 3 of the Harmatta patent?

A. I would consider these rods with concaved, opposing surfaces, so that each electrode bore on the work by means of two restricted areas.

×-Q. 158. Do you regard the end of each of the rods shown in Fig. 3 as simply bifurcated, or as concaved, or hollowed out?

A. Bifurcated.

×-Q. 159. How would electrodes shown in Fig. 3 of the patent perform, if used in place of the electrodes shown in Fig. 1 of the patent?

A. I have never used electrodes of this type, but it is my view of the matter that, under careful conditions, two independent welds might be produced. It is also my opinion that it would be a very difficult tool to keep in proper shape, in spot welding.

×-Q. 160. Wouldn't such tools be liable to produce extrusion of metal?

A. I have not had sufficient experience with a tool of this type to answer your question definitely.

(Adjourned to Tuesday, May 7, 1918, 9.30 A. M.)

BOSTON, MASS., May 7, 1918, 9.30 A. M.

Met pursuant to adjournment.

Counsel present as before.

×-Q. 161. If instead of utilizing the bifurcated or grooved form of electrodes shown in Fig. 3 of the Harmatta patent to heat and clamp sheets of metal until raised to a welding temperature you should cause such electrodes to clamp a metal rivet blank fitting the bifurcations or grooves, you could thus by turning on the current heat and soften such rivet blank, could you not?

A. Yes.

×-Q. 162. What would cause the rivet blank to be softened in the case I have supposed?

A. The concentration of the electricity by having to pass through the relatively small cross-section of the rivet blank.

×-Q. 163. Might not this use of the electrodes shown in Fig. 3 of the Harmatta patent have been in contemplation by Harmatta in the absence of any explanation in the patent to the contrary?

A. Of course it is impossible for me to know what was in Harmatta's mind, and without trying in any way to interpret Harmatta's patent, it is my opinion that Fig. 3 of Harmatta's patent certainly does not show setting tools for electric riveting. I say this because in electric riveting cupped-shaped terminals must be used in order to properly seat themselves on the heads of the rivets and also to form a satisfactory head on the straight shank. The terminals shown in Fig. 3 of Harmatta's patent are not cupped-shaped, but can be looked at as a blunt rod on which two projections or teeth have been formed, that is, the terminals are not cupped-shaped. In case the rivet was placed at right angles to the plane of the electrodes, so that the current was passed transversely through the rivet, I should also think Fig. 3 would indicate that the heating of the rivets was not in Harmatta's mind, because the groove formed by the welding tools is of an angular shape, and it seems to me these grooves would have been made round in conformity to the shape of a rivet, which seems to me is always thought of as a round body.

×-Q. 164. The truth is, however, that the form of electrodes shown in Fig. 3 of the Harmatta patent might be utilized for the softening of interposed metal sheets in order to weld them, or the

softening of material like a metal rivet interposed between them. Is this not so?

A. If you mean the softening of metal under these terminals shown in Fig. 3, so that after the metal has become sufficiently heated to be transferred to another set of electrodes for welding, I should say that I do not see how this could have been in Harmatta's mind, because the metal on thin sheets, as Harmatta speaks of, cools off so quickly that I do not see, even if the metal was heated for welding, how it could have been subsequently welded, still maintaining the heat produced by the electrodes, as shown in Fig. 3. As for softening a rivet, I still think if Harmatta had had this in mind, the terminals would have been of a different shape. Whether or not the electrodes shown in Fig. 3 could be used for the purposes you mention, I have not had an opportunity to experiment and therefore I cannot answer definitely. I should think, however, that certain modifications would be necessary before they could be used advantageously on commercial work.

×-Q. 165. I show you a patent to Blanchard No. 466,266, dated December 29, 1891, for electric heating tools. I call your attention to the fact that the appliance of this patent is stated to be used primarily for heating rivets by electric current. If you were to interpose overlapped or superposed thin sheets of metal between the copper electrode *b b* of this Blanchard appliance, could you not also spot weld with it?

A. Blanchard's patent No. 466,266 shows an apparatus for heating rivets. The rivets which this machine has to do with are those which are heated for upsetting. Small rivets are upset cold; therefore, the rivets shown in Fig. 1 are large rivets—I should say at least three-eighths of an inch in diameter. In order to heat rivets of this kind along their whole length, the rivet would have to be grasped nearly along its whole length as shown. These blocks that grasp the rivet are secured to the ends of two conductors, which are much smaller in cross-section than the blocks.

If, now, these blocks were made to bear on superimposed thicknesses of metal, it is quite plainly indicated that the current is diffused by the blocks instead of being concentrated as is one of the characteristics of the Harmatta process, and although by careful manipulation a spot weld might be produced as a feat, the appa-

tus certainly would be of little use commercially for the spot welding purpose. The apparatus is connected to the source of power C by means of cables, which must be long enough to move the rivet from one point to another, and therefore these cables must be flexible, and as the apparatus is operated by hand, the cables must be light, and although, as I have stated, a spot weld might be produced as a feat, it is a question whether any weld would be produced with this apparatus. It should be noticed that the electrodes which pass the current through the work have a bearing on the surface of the work larger than any other cross-section of the circuit shown. The electrodes therefore do not concentrate the current as it passes through the work.

×-Q. 166. Would the disclosure of this Blanchard patent teach you how to electrically heat and soften metallic rivets?

A. Personally I do not believe that it would, because I do not think the apparatus as disclosed would be a satisfactory means of doing this.

×-Q. 167. Do the considerations of the flexibility of the conductors, or of the cross-section of the conductors, or of the electrodes shown in the drawings of this patent enter into the reasons for the conclusions you have stated in regard to the practicability of this Blanchard device.

By Mr. STACKPOLE. All questions in regard to this Blanchard patent are objected to as outside of the direct examination.

A. The reasons for my conclusions in regard to this matter are that I do not think that the whole principle utilized in this invention for heating rivets is a practical one, and I believe that if one skilled in the art, or otherwise, would try to follow the inventor's ideas, it would not be conducive to practical results.

×-Q. 168. Do you mean by that that rivets could not be heated and softened as proposed by Blanchard?

A. I have had no opportunity to try out experiments along these lines, but my opinion is that from at least a commercial standpoint rivets could not be heated according to Blanchard's process. I say this because according to Blanchard the current must be kept on quite a length of time in order to heat the rivets, and in keeping the current on for this time the whole apparatus would become

unduly heated, not only from the heat generated within the metal of the apparatus due to its own resistance, but it is clear that so much metal lying in contact with the heated rivet would conduct enormous amounts of energy away from the rivet, and the clamp blocks would become very heated.

X-Q. 169. I show you now a patent to Charles N. Coffin, No. 437,571, dated September 30, 1890, for "Process of Electrically Welding Metal", and calling your attention particularly to the modification of apparatus shown in Fig. 5 and to the description thereof in the specification, I ask you whether you think that that apparatus is also inoperative to produce electric welding?

By Mr. STACKPOLE. Objected to as without the scope of the direct examination.

A. This apparatus consists of mechanism for pressing carbon blocks at the points to be welded. According to lines 43-54 of page 1, the articles to be welded are heated at their point of contact between the carbon block and the work. I would not say that this patent was entirely inoperative, but I have never seen the invention as shown here come into use on commercial work.

X-Q. 170. Do you regard the form of electrodes shown in Fig. 4 of the Harmatta patent as in any essential respect different from the form shown in Fig. 3, or from the form shown in Fig. 1 of the patent?

A. I have never experimented to determine the differences between electrodes shown in Figs. 1, 3 and 4. I consider, offhand, that Figures 1 and 4 show electrodes which give practically the same results. Figure No. 3 I believe would be difficult to maintain in practice.

X-Q. 171. But still you think you could spot weld with electrodes shown in Fig. 3, don't you?

A. I believe that spot welding can be done with electrodes shown in Fig. 3.

X-Q. 172. Suppose you introduced into an otherwise competent apparatus electrodes like those shown in Fig. 4, for instance, and shifted the work, or shifted the electrodes laterally with respect to the work while pressure and current were maintained; would the result be spot welding?

A. I would call this "line" welding. It would have many of the characteristics of the Harmatta process.

X-Q. 173. If the line of welding produced were a quarter of an inch long, it would be spot welding, wouldn't it?

A. As long as the work moved in relation to the tools I would call it line welding irrespective of how long that line was.

X-Q. 174. Question repeated.

A. I can only answer my views of the matter, which are that I would call it "line" welding as long as the work moved in relation to the tool.

X-Q. 175. But would that so-called "line welding" also be "spot welding" according to your definition of spot welding heretofore given in this case?

A. In many of the characteristics it would, but when the work is moving in relation to the tool it will be noted that the work having passed under the tool still remains heated for an appreciable length of time; therefore the metal being welded is not entirely surrounded by relatively cold metal.

X-Q. 176. Question repeated.

A. In my definition of spot welding, I have said that the metal heated for welding is entirely surrounded by relatively cold metal. When the work is moved in relation to the terminals during the welding, that part of the metal which has been under the electrodes and is slightly removed so as to allow other metal to take its place and be heated for welding, still remains hot, so that now the metal being heated for welding is not entirely surrounded by relatively cold metal, being bounded on one side by the metal which has already been heated and welded. There, therefore, is a difference between line welding and spot welding. That is, they differ in this one characteristic at least.

X-Q. 177. Am I to understand you to say that the line welding, such as would take place under the conditions set out in X-Q. 172 would not be spot welding? Please answer yes or no.

By Mr. STACKPOLE. The witness is reminded that he need not answer the question yes or no, if the question does not permit of such an answer, and that he is entitled to explain any answer that he may give.

A. I cannot answer yes or no without danger of misleading those who would read my answer. It is evident that if the metal was only moved .001 of an inch in relation to the tools, the product would to all intents and purposes appear as a spot weld, yet if the movement was continued for several inches, it would plainly show on the product as a line weld.

X-Q. 178. A line weld may therefore be a spot weld or not according to its length. Do I understand you correctly?

A. No, you do not. I would call a weld, irrespective of its shape, a spot weld if the process producing that weld had the characteristics which I have previously mentioned. I would call a weld a line weld if the terminals making that weld moved in relation to the work, or the weld was made progressively irrespective of its length.

X-Q. 179. When does a line weld become a spot weld?

A. According to my ideas, a line weld cannot become a spot weld.

X-Q. 180. When does a spot weld become a line weld?

A. I cannot imagine a spot weld becoming a line weld.

X-Q. 181. I am going to ask you to again state as clearly as you may the distinguishing difference between what you call a line weld and a spot weld?

A. A line weld and a spot weld have many characteristics in common. I would call a spot weld one where the work did not move transversely in relation to the electrodes making it. I would call a line weld one in which the work moved transversely in relation to the centre line of the electrodes.

X-Q. 182. Do you wish to be understood as abandoning or as including in your definition of spot welding the point that the metal being heated for welding is entirely surrounded by relatively cold metal?

A. In spot welding the metal heated for welding is entirely surrounded by relatively cold metal. That is my understanding of one of the characteristics of the spot welding process.

X-Q. 183. What do you mean by relatively cold metal? How much difference in temperature must there be between the metal at the point of welding and the metal that surrounds the metal at the point of welding? The term "relatively cold" seems to be very indefinite.



A. There is, of course, no distinct boundaries between cold metal and hot metal. For the sake of argument, I will say that I mean, by cold metal, metal which conducts the heat away rapidly, and by hot metal, metal which owing to its temperature does not conduct the heat away rapidly.

X-Q. 184. Would you draw the line between metal that is in a plastic, fusible and welding state and metal that is not in that condition, calling the first named "hot metal" and the last named "relatively cold metal"?

A. No, I would not do this. I would rather have as my dividing line metal heated above a red heat, as representing what I mean by hot metal, and metal below a red heat as that representing cold metal.

X-Q. 185. In ordinary spot welding operations with electrodes having a bearing surface of, say, a quarter of an inch across, how long does it take to make a spot weld?

A. This will depend on the thickness and quality of the work and on the current used. I cannot answer your question without knowing these things.

X-Q. 186. How rapidly have you ever seen welds made with electrodes having contact faces of the dimensions stated in my last question.

A. About two welds a second.

X-Q. 187. In other words, a weld every half second?

A. Yes, sir.

X-Q. 188. And yet, if I understand you, a succession of welds a quarter of an inch in diameter made to overlap one another at the rate of a weld each half second would be spot welding. Am I not right in this?

A. You are right if you understand what I have said that I would call such an operation spot welding in so far as it agrees with the characteristics of spot welding which I have given.

X-Q. 189. And would it be spot welding if the successive welds were overlapped upon their predecessors while the latter were above a red heat?

A. I would call it spot welding in so far as it agrees with my enumeration of the characteristics of spot welding.

X-Q. 190. In the case as last put, would each of the welds be

entirely surrounded at the time of welding by relatively cold metal according to your definition?

A. I cannot answer this question as intelligently as what I would like, as I have not experimented with this question in mind. My opinion, however, is that in the thin sheet metal the metal will cool off so rapidly that one weld will be below a red heat before the other weld is made. This, of course, would not be true when the work consisted of heavy plates, say three-eighths of an inch in diameter.

X-Q. 191. If instead of the pointed, or rounded, or bifurcated electrodes shown in the Harmatta patent, electrodes consisting of rollers were employed, could you spot weld with them; and, if so, under what conditions?

A. I believe a spot weld could be made with rolls as electrodes provided they were made to bear at a small area on the work; of course, provided that proper apparatus and sufficient current was employed.

X-Q. 192. Have you ever made spot welds with roller electrodes?

A. I never remember having made spot welds with roller electrodes.

X-Q. 193. Did you ever see a spot weld made with or that had been made with roller electrodes?

A. I do not recall any such weld.

X-Q. 194. Did you ever try to spot weld with roller electrodes?

A. I never did.

X-Q. 195. Did you ever try to make what you call a line weld with roller electrodes in an electric welding machine?

A. I do not remember ever having made a line weld or trying to make a line weld with roller electrodes.

X-Q. 196. Did you ever operate or see operated an electric welding machine employing roller electrodes?

A. Yes; I have built and operated machines for lap seam welding and butt seam welding by means of roller electrodes.

X-Q. 197. What were the rollers made of?

A. The rolls were made of copper.

X-Q. 198. What was their diameter and the width of their contact surfaces?

A. I will tell you the best I can from memory, as it has been a

long time since these matters have been in my mind. One set of rolls I have in mind were about ten inches in diameter. The bearing face was approximately two inches in width. These were used for butt seamed welding tubes approximately two and one-eighth inches in diameter. Another set I remember were about two feet in diameter and had a bearing surface of about one inch wide. These were also used for butt seamed welding tubes of two and one-eighth inches in diameter. Another set I recall were about six inches in diameter, with flat faces about one inch wide. These were for lapped seamed welding sheets together.

X-Q. 199. If in the apparatus shown in the Harmatta patent roller electrodes were employed and caused to act upon successive and separated spots on the overlapped or superposed sheets, spot welding would result, would it not?

A. If these rolls were constructed so as to take the place of Harmatta's electrodes, I believe a spot weld could be secured.

X-Q. 200. Suppose the roller electrodes were narrow and had a rounded contact surface, they would spot weld if they were brought successively against the superposed plates at intervals, or remote points, but they would not spot weld if they were kept in contact with plates while the plates were pulled through between them. Do I state the matter fairly?

A. I have had no experience in using rolls for spot welding or in making line welds, and can only tell you what I believe will result. I believe if the rolls were simply given an up and down motion and properly shaped, they would afford crude means for obtaining a spot weld. If, however, the rolls were clamped tight against the work, and the work moved through the rolls, I believe a line weld could be secured.

X-Q. 201. And that the line weld to which you refer would not be a spot weld?

A. According to my idea of the two processes, the processes for securing the weld would be distinguished as line welding and spot welding.

X-Q. 202. What definite statement is there in the Harmatta patent indicating that the Harmatta process is to be used for the production of sheet metal ware like vessels or household utensils?

A. I should say in lines 14 to 21, page 1.

X-Q. 203. Is there any other statement in the patent to that effect?

A. It refers throughout the patent to sheet metal, and as household utensils are made of sheet metal, it may be here also he refers to the subject you have in mind.

X-Q. 204. Is there any other statement except in the portions of the patent you have definitely referred to?

A. I believe that is the only place he refers to household utensils.

X-Q. 205. What definite statement is there in the patent to the effect that the spot or spots welded are surrounded by comparatively large areas of opposed surfaces in which no weld is made?

A. In order to distinguish Harmatta's welds from other welds and to give a good idea of what he is talking about, he refers to this matter from lines 47, page 1, to 56, page 1.

X-Q. 206. Anywhere else?

A. What I have noted is the only reference distinctly indicative outside of the claims.

X-Q. 207. What statement is there in the Harmatta patent to indicate that the parts to be united are to be welded only by heat developed by the resistance of the plates themselves to the passage of the electric current?

A. His statement that his process relates to the Thomson welding would indicate this to me.

X-Q. 208. Where in the patent is this pointed out?

A. He says his invention relates to electric welding, lines 5-7, page 1. He then describes what he means by electric welding, lines 57-64, page 1.

X-Q. 209. Have you now pointed out all the passages in the patent, exclusive of the claims, indicating that the resistance of the plates themselves is relied upon to develop the requisite welding heat?

A. In connection with his statements which I have already related, his statement that the flow of heating current is passed through the work (lines 50-51, page 2) would to me corroborate the statements which I have pointed out.

X-Q. 210. You do not regard the statements which you have pointed out in response to X-Q. 201 and succeeding questions as necessary to the disclosure of what you call "spot welding", do

you? In other words, all the statements to which you have referred might be eliminated from the patent and there would be left an adequate disclosure of spot welding, would there not?

A. I believe there is still sufficient matter left in the patent to guide me at the time of Harmatta's invention to still realize the general character of his invention.

(Recess).

×-Q. 211. On pages 4 and 5 [printed page 30] of your direct examination you stated that in the year 1910 you entered the employment of the Hale & Kilburn Company of Philadelphia as "engineer on electric welding", and entered upon a two years' study of the properties of the welding circuit; that you made investigations on original lines assisted by your cousin, who helped you materially on the difficult mathematics of the subject; that you found your calculations for butt welding were fairly correct, but were of no value in calculating the welding circuit for spot welding, for the reasons, first, that the current used for spot welding was comparatively large, and secondly, because the heat losses in spot welding had to be treated very differently from those in an ordinary circuit. I ask you if there is anything said in the Harmatta patent about the use of currents comparatively large or about heat losses? If so, please point it out.

A. There is nothing distinctly stated in the Harmatta patent regarding these things, but they would be soon discovered or brought to the attention of the experimenter on carrying out Harmatta's instructions of adjusting the currents, etc., as indicated in Harmatta's patent, lines 69-76, page 2.

×-Q. 212. On page 6 [printed page 31] of your direct examination you say that the Harmatta process is intended to be used on superposed metal sheets to replace riveting without changing the work in any way. Is there anything said in the Harmatta patent about the method of patent not changing the work in any way?

A. Nothing except he refers to his process as replacing riveting, and from the general disclosures of the patent, especially the disclosure of Figure No. 1.

×-Q. 213. In your direct examination you speak of the pressure on the tools described by Harmatta as being the same as in riveting. Is there anything said in the patent about this?

A. There is no comparison of this nature in the patent itself except what might be culled from the general description of the patent and the disclosure of Figure No. 1.

×-Q. 214. On page 7 [printed page 31] of your examination you speak of Harmatta's use of tapered or pointed electrodes. Do you regard the use of such electrodes as necessary or only desirable in the practice of the Harmatta method?

A. The actual contact between the tool and the work in the Harmatta process should be over a restricted area, and a pointed terminal seems to me would be the easiest and most satisfactory method of securing this condition.

×-Q. 215. On page 7 [printed page 31] of your direct examination you speak of the heated soft metal being confined by the relatively cold metal about it. Is there anything said about this in the Harmatta patent?

A. No direct statement regarding this matter I believe is contained in the Harmatta patent, but it surely is implied by a number of statements therein contained.

×-Q. 216. On the same page of your direct examination you also say that the soft metal cannot extrude. Do you find anything in the patent about the extrusion or non-extrusion of metal?

A. There is no direct statement regarding this matter, but it is certainly implied by Harmatta's description.

×-Q. 217. On page 7 [printed page 31] of your direct examination you also say "the current is then interrupted and the tools removed from the superposed sheet". Is there any statement in the patent to the effect that the current is interrupted before the tools are removed from the superposed sheets? If so, please point it out.

A. It is not said directly that the current is interrupted only in so far as the patent refers to the Thomson process of welding, where it was customary to interrupt the current before the work was taken out of the welding machine. I also believe that lines 69-76 refer to this.

×-Q. 218. On the same page of your direct examination you say the heated spot cools almost instantly, due to the masses of cold metal surrounding it. Is there anything said in the patent about this instant cooling of the metal?

A. There is no direct reference to this matter, but as Harmatta does not tell us to wait until the metal cools off before removing it from the terminals, I believe this is implied. (See lines 77-82, p. 2.)

X-Q. 219. On page 8 [printed page 32] you say that the heat marks of the completed weld show that the current has been confined to a restricted area as it passed through the work. Is there anything in the patent about heat marks?

A. I do not believe that the patent refers to heat marks.

X-Q. 220. On the same page you say that the Harmatta process "entirely dispenses with clamps and rollers and is commercially very inexpensive, as no preparation for the work is required and no dressing or finishing of the weld is necessary after the welding has been completed". Is there anything in the patent about this?

A. These direct statements are not made in the patent, but as the process is to take the place of riveting, and has taken the place of riveting, it must necessarily be a very cheap process. Harmatta certainly implies, lines 83-91, page 2, that the finished work is comparatively clean, leaving nothing behind that is objectionable, not even metal like the head of a rivet.

X-Q. 221. On page 10 [printed page 33] of your direct examination, in attempting to describe the defendant's machine you lay stress upon the fact that its tapered electrodes are of good conductivity. Is there anything said in the Harmatta patent about the use of electrodes of good conductivity?

A. Only in so far as Harmatta classes his invention under the head of the Thomson process, where electrodes of good conductivity are used. He also speaks of this process of generating the heat within the work itself, which to my mind would indicate that the electrodes must be of good conductivity.

X-Q. 222. In the suit of *Thomson Electric Welding Company v. Barney & Berry, Inc.*, upon the Harmatta patent here involved were you identified in interest with the plaintiff or with the defendant?

A. I assisted the Thomson Electric Welding Company, which was the plaintiff.

X-Q. 223. In the interference case now pending between the Harmatta patent and the application of Sebastian Ziani DeFerranti



Interference 36,709, did you not on April 13, 1916, appear as a witness for the plaintiff here, the owner of the Harmatta patent?

A. I did, but I cannot remember whether this is the exact date or not. I was called in this interference case by Townsend & Decker, New York.

X-Q. 224. You are familiar with an organization known as the Welding Patents Investigating Committee, are you not?

A. I am.

X-Q. 225. One of the purposes of that committee is to collect evidence with which to resist the demands of the owners of the Harmatta patent in suit, is it not?

A. I believe so. I believe one of its objects is for that purpose.

X-Q. 226. And you understand, do you not, that that committee was and is engaged in the collection of materials of defence for use in any suit that might be brought against any of its members under the Harmatta patent, do you not?

A. I believe that is right.

X-Q. 227. Did you at any time attend any of the meetings of this committee; and, if so, where and when?

A. I remember having attended one of the meetings at Canton. I believe this was the first meeting of the committee. I attended another meeting in Cleveland.

X-Q. 228. For what concern did you purport to be a representative at these meetings?

A. The American Chemical Paint Company of Philadelphia.

X-Q. 229. Did not the American Chemical Paint Company become a contributing member of the committee and pay the several assessments that were required of it in order to carry on the work of the committee?

A. It did.

X-Q. 230. What was the basis upon which those assessments were levied, and how much did your company pay?

A. I do not remember how much the company paid, but I remember we paid all the assessments as they became due. The assessments were based on the number of welding machines which the contributors possessed.

X-Q. 231. Did the American Chemical Paint Company possess

at that time one or more spot welders ; and, if so, for what purpose was it or them used by it ?

A. The American Chemical Paint Company had at its works a large welding machine which was designed and built by me. Mr. Tilghman and myself, who are really the American Chemical Paint Company, thought very seriously of going into the electric welding business. Mr. Tilghman, however, and also myself were uncertain as to what might develop regarding the electric welding patents, and it was finally decided to wait for the outcome of the future, and so the welding machine was not put in operation.

X-Q. 232. Did your company have but one welding machine ?

A. We had but one welding machine.

X-Q. 233. And you contributed to the committee on the basis of one welding machine, did you not ?

A. Yes.

X-Q. 234. During the time of the adherence of the American Chemical Paint Company to this committee you were at different periods the secretary and president of that company, were you not ?

A. Yes.

X-Q. 235. You were also at the same time under a retainer from the plaintiff or identified in interest with the plaintiff in this case, were you not ?

A. I was only employed by the plaintiff during the time the Barney & Berry case was appealed and for a short time during the pending of the DeFerranti interference. It was not until about a year ago that I was continuously retained by the plaintiff.

X-Q. 236. Your object in joining with the Welding Patents Investigating Committee and in contributing to its funds was not for the purpose of furthering the work of that committee but for the purpose of spying upon its operations and furnishing information to the plaintiff in this suit, was it not ?

A. I do not think you have put this in a very good way. I was on what you might say both sides at the same time. When my company joined the Welding Patents Investigating Committee I was not under a retainer by the plaintiff, and as soon as I felt that I could be looked at as a spy I had the secretary of the American Chemical Paint Company write Mr. Milligan, the leader of the Patents Investigating Committee, a letter setting forth my position

and the position of our company, and requesting them to advise the American Chemical Paint Company if they thought under the circumstances the American Chemical Paint Company should resign from the committee. Mr. Milligan wrote back saying that he did not think this was necessary.

×-Q. 237. I show you a copy of a letter, dated February 28, 1917, addressed to Mr. J. H. Gravell, American Chemical Paint Company, Philadelphia, and ask you to state if you received from Mr. H. C. Milligan, chairman of Welding Patents Investigating Committee, the original of which this letter is a copy?

A. I believe I recall the receipt of this letter.

(Letter marked for identification "Defendant's Exhibit A-1".)

×-Q. 238. I also show you a letter, dated March 2, 1917, directed to the Welding Patents Investigating Committee, and signed "American Chemical Paint Company, J. H. Gravell", and ask if that is a letter which you dictated and signed?

A. That is the letter.

(Letter marked for identification "Defendant's Exhibit A-2".)

×-Q. 239. I also show you a letter, dated March 9, 1917, addressed to Mr. H. C. Milligan, chairman, and signed "American Chemical Paint Company, B. C. Tilghman, President", and ask you if you did not dictate that letter, and if the initials "J. H. G." in the lower left-hand corner do not so indicate?

A. I do not remember having dictated this letter, but no doubt did, as my initials appear upon it.

(Letter marked for identification "Defendant's Exhibit A-3".)

×-Q. 240. I also show you a copy of a letter, dated March 12, 1917, directed to Mr. B. C. Tilghman, president American Chemical Paint Company, Philadelphia, Pa., acknowledging receipt of a contribution of ten dollars to the cause of the Welding Patents Investigating Committee, and ask you if such a letter was not received by American Chemical Paint Company from Mr. H. C. Milligan, chairman?

A. I have no reason to doubt that this letter is authentic.

(Letter marked for identification "Defendant's Exhibit A-4".)

×-Q. 241. I also show you another letter, dated May 22, 1917,

addressed to Welding Patents Investigating Committee, and signed "American Chemical Paint Company, B. C. Tilghman, President", stating that a check is enclosed for twenty dollars, and ask you if this was not a letter forwarding a contribution made by your company to the investigations being carried on by that committee?

A. I believe that it was.

(Letter marked for identification "Defendant's Exhibit A-5".)

×-Q. 242. I also draw your attention to a copy of a letter, dated May 28, 1917, addressed to American Chemical Paint Company, acknowledging receipt of twenty dollars, and expressing appreciation of the hearty co-operation of American Chemical Paint Company in the committee's work, and ask you if such a letter as that was not received by American Chemical Paint Company from the committee?

A. I have every reason to believe that it was.

(Letter marked for identification "Defendant's Exhibit A-6".)

×-Q. 243. I also draw your attention to a letter of October 22, 1917, addressed to the Welding Patents Investigating Committee and signed "American Chemical Paint Company, F. H. Schukraft," and ask you who F. H. Schukraft is, and if such a communication was not sent out by American Chemical Paint Company?

A. F. H. Schukraft is the stenographer for the American Chemical Paint Company and I have no reason to doubt that this letter was sent.

(Letter marked for identification "Defendant's Exhibit A-7".)

×-Q. 244. Mr. Gravell, while you and your company, American Chemical Paint Company, were thus ostensibly operating and working with and in the interest of the Welding Patents Investigating Committee, did you not at Canton, Ohio, in the office of Mr. H. C. Milligan, chairman of that committee, state to Mr. Milligan that you had helped win the suit on the Harmatta patent against Barney & Berry, Inc.?

A. I do not remember exactly what I said, but probably I said this.

×-Q. 245. Did you not at the same time and place state to Mr. Milligan that you had information or knowledge that would enable

the Harmatta patent to be defeated, or words to that purport or effect?

A. I do not remember ever having made such a statement to Mr. Milligan. I probably said, as I did to Mr. Carriek at one time, that if they really had disclosures showing the Harmatta patent to be worthless, I could arrange matters in such a way that their suit could be won.

×-Q. 246. Do you deny making to Mr. Milligan a statement in substance or effect like that mentioned in my last question?

A. I am quite sure I did not state to Mr. Milligan that I had information which would invalidate the Harmatta patent.

×-Q. 247. And did not Mr. Milligan at the time and place before stated ask you what your information was and didn't you ask him what it would be worth to him to have it, or words to that purport or effect?

A. I may have mentioned in a conversation that I would not go into the matter without a compensation and would like to know what was offered, or some words to that effect.

×-Q. 248. Did Mr. Milligan at the time and place mentioned offer you anything for your information?

A. Mr. Milligan did not offer me any inducement and, in fact, talked in such a way regarding the original suit and its appeal, saying that it was a prearranged affair, that I remember that I got very mad, and for that reason I do not recall everything I said and everything that Mr. Milligan said.

×-Q. 249. When in August or September, 1917, the Federal Welder Company had taken over the plant of the National Electric Welder Company of Warren, Ohio, didn't you or your company, American Chemical Paint Company, endeavor to secure some of the shares of stock or bonds of the Federal Machine & Welder Company and was not your offer refused?

A. Yes.

×-Q. 250. Please examine the letter I now show you, dated September 1, 1917, addressed to the Federal Machine & Welder Company and signed "American Chemical Paint Company, F. H. Schukraft", tendering a subscription of two hundred and fifty dollars and enclosing check for ten dollars, being ten per cent of

the subscribed stock, and ask you if such a letter was not written and sent by your company?

A. I believe that it was. I am not sure but that I did not dictate that letter.

(Letter marked for identification "Defendant's Exhibit A-8".)

×-Q. 251. Please examine copy of a letter, dated September 5, 1917, addressed to American Chemical Paint Company, and state if the original of this letter was not received by your company from Mr. Ralph Lounsbury, chairman of the Committee of Organization of the Federal Machine & Welder Company?

A. I believe that such a letter was received.

(Letter marked for identification "Defendant's Exhibit A-9".)

×-Q. 252. At the time of this attempted subscription to the stock and bonds of the Federal Machine & Welder Company by your company, you were retained by the plaintiff in this suit, were you not?

A. Yes, I believe I was.

×-Q. 253. During your direct examination you produced a sample of so-called spot welding, which you testified you had personally welded on one of the welding machines at the defendant's plant on January 9, 1918, the said sample being marked "Plaintiff's Exhibit No. 7, Gravell Specimen of Ford Welding". I now ask you how and under what circumstances you obtained access to the welding machine at the Ford plant to enable you to perform this work?

A. I went to the Ford Company and asked if they ever allowed people to go through their works. They replied that they did. A guide took me through the works, and among many other things showed me some spot welding machines. I picked up two scraps of steel and placed them between the terminals of a welding machine and operated the machine twice to produce the sample. The guide told me to take it with me as a sample of spot welding.

×-Q. 254. Did you ask permission of the guide to do this work?

A. I believe I made the remark such as "I wonder if I can operate that spot welding machine", and if my memory serves me correctly both the guide and myself operated the machine. I do not remember having said to the guide "May I spot weld on this machine?"

x-Q. 255. Did you ask the workman in charge of this spot welding machine to permit you to do this piece of spot welding?

A. I do not remember having any conversation with any of the workmen in the plant.

x-Q. 256. Was there a workman present at the spot welding machine upon which you performed this operation of welding?

A. I do not remember that there was a workman working at this machine on which I did this spot welding just prior to my trying it, but I believe the machine felt warm as if it had been used recently. My memory on this point is a little hazy.

x-Q. 257. Upon what product or article was this particular machine being used judging from the nature of the articles about it that had been or were about to be spot welded?

A. I saw so many welding machines in so many departments and as my trip was necessarily hurried, I may be mistaken, but I think the department was that in which the products of a nature shown in Plaintiff's Exhibit No. 2 were manufactured, that is, parts of mufflers.

x-Q. 258. Did you see any of the mufflers made and spot welded while you were in the factory?

A. I remember having seen the mufflers, but I do not remember having seen them spot welded, as it was rather late in the afternoon when I went through the factory.

x-Q. 259. Did you procure the muffler Plaintiff's Exhibit No. 2, and deliver it to plaintiff or plaintiff's counsel?

A. No, I did not.

x-Q. 260. Do you know where it came from?

A. No.

x-Q. 261. Are we to understand that, on the occasion of doing this spot welding on Plaintiff's Exhibit No. 7, you picked up from the floor flat pieces of sheet steel and subjected them to the action of one of defendant's welding machines to produce the welds, and then carried the specimen off with you and offered it in evidence in connection with your testimony in this case?

A. Yes.

x-Q. 262. Was your name recorded as a visitor when you visited the Ford plant on this occasion?

A. A name was recorded; that is, I used an assumed name.



District Court of the United States, Eastern District of Michigan,  
Southern Division. In Equity.

THOMSON SPOT WELDER COMPANY, Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

On Harmatta Patent No. 1,046,066.

Evidence for the plaintiff taken under the Revised Statutes of  
the United States by agreement of counsel, before me,

GEORGE W. KNAPP, Jr.,

[SEAL]

*Notary Public.*

Met pursuant to agreement of counsel at the offices of the National  
Enameling & Stamping Company, Light Street, Baltimore, Mary-  
land, at 11 o'clock A. M., September 25, 1918.

Present: GEORGE C. ARVEDSON, Esq., of Counsel for Plaintiff;  
MELVILLE CHURCH, Esq., of Counsel for Defendant.

Thereupon GEORGE W. KNAPP, a witness of lawful age, pro-  
duced on behalf of the complainant, having been first duly sworn  
to testify the truth, the whole truth and nothing but the truth,  
deposes and says as follows:—

Direct examination.

By Mr. ARVEDSON.

Q. 1. Please state your name, age, residence and occupation.

A. My name is George W. Knapp; my age is seventy; my resi-  
dence is Baltimore County, Catonsville, Maryland. I am an officer  
of the National Enameling & Stamping Company; director general  
is the title of my office. The duties of the director general are  
taking care of the physical end of the whole National Company, the  
different factories. I am also a member of the executive board  
and a director in the National Company.

Q. 2. Did you ever meet any representatives of the Eisenhutte  
Silesia Aktien-Gesellschaft?

A. I have met the president, Mr. Winkler. I also met Mr.  
Schweisfurt, who was the general manager of the works. I do not  
know whether he was director general or not; I am not sure that  
that was his title. He was the head of the physical end of the

enameling works. They were the two men I saw that had this electric device.

Q. 3. What was Mr. Winkler's position?

A. I understood he was president of the Silesia Company.

Q. 4. What business did these two gentlemen have with you or your company when you first met them?

A. They came on here to sell the electric spot welding outfit.

Q. 5. Can you fix the time in any way of your first interview with them?

A. It was in 1904; I cannot say in what month.

Q. 6. What happened as a result of this first interview with them?

A. They brought their invention before the executive board of the National Company and Mr. Haberman was then our vice-president, and Mr. Haberman and I were deputized to go to Europe to investigate this electric welding device or invention, whichever you call it.

Q. 7. Did you go to Europe?

A. Yes, we went to Europe. Mr. Winkler met us in Berlin. We talked about the purchase of this electric process, and we found out that they would not show us what they had until we deposited \$10,000 in the Bank of Berlin, in the Deutsch Bank of Berlin. We telegraphed back to America for \$10,000 and the \$10,000 was deposited with a banking concern in New York, Heidelbach, Ickelheimer & Company. We deposited the \$10,000 in the bank in America, that is, our people did, to our order, and transmitted to the Berlin bank before these Silesia people would show us the machine. Well, we deposited the money and then we went out to the Silesia works, out to their factories, and examined the invention. We were pleased with the invention and we came back and signed an agreement to purchase it for \$10,000. I have here the old cancelled check for the \$10,000.

Mr. ARVEDSON. The plaintiff offers in evidence the original cancelled check produced by the witness, being the check of the National Enameling & Stamping Company, dated December 2, 1904, showing the payment of \$10,003 for this purpose.

Q. 8. Will you please read the check which you have just produced into the record?

session of the National Enameling & Stamping Company, to be produced at the trial if called for.)

Q. 13. Then, if I understand you correctly, you were in Germany in 1912, after your trip in 1904?

A. Yes, I believe that was the time. I was not there in connection with the electric welding machine, though I did see Mr. Winkler when I was there.

Q. 14. Did you obtain any machinery in Germany at the time of this visit in 1904?

A. Yes.

Q. 15. What machinery was that?

A. In the contract that was made with the Silesia people, that is, with this ten thousand dollars, they were to give me two electric welding machines. Then I purchased from the Allgemeine Electricitats Gesellschaft a dynamo and switchboard and such accessories as would go with these two welding machines that the Silesia people gave me as part of the contract for the ten thousand dollars.

Q. 16. Did you ever receive these machines?

A. Yes, and I have them in the factory now.

Q. 17. Did you ever receive bills for those machines?

A. Yes.

Q. 18. Have you the original bills?

A. No; the original bills went to the central office. We have a book at the factory wherein we enter all the bills and then send the original to the central office for payment. But we have a book where we enter all machinery of every description.

Q. 19. Since you are unable to produce the original bills, can you produce the book containing the copies of those bills?

A. Yes, I can.

(Witness presents book to counsel.)

Q. 20. Will you read into the record the entries in the book which you have just produced?

A.

"Feb. 15. We are sending you through Messrs. Lorenz & Schmidt of Hamburg carriage forward to Baltimore E. S. No. 3

One case gross weight 402 k countg 1		
Electric Machine in separate parts . . .	525.00	
Consul's fee . . . . .	10.60 Mk	535.60

"15. We are sending you through Messrs.		
Lorenz & Schmidt of Hamburg carriage		
forward to Baltimore C L N. 1-ounce case		
gross weight 326 o. Kg. cont'g Electric		
machine ready mounted . . . . .		
	525.00	
E. L. N. 2-1-case gross o. weight 353 o kg.		
cont'g 1-electric machine ready mounted,		
	525.00	
E L N. 3-1 case gross weight 402 o kg. 1-		
electric machine in separate parts . . .		
	525.00	
Consul chgs . . . . .	10.60	
The cost of cases of packing amounting to		
S. L. k70 are included in the above prices		
Deduct frt. by Am. Hamburg . . .	25.30	1560.30

## May 31. Eisenhutte Silesia

1 case Gross 1233 Net 960 kg. A E G 2934	
1 case " 177 " 155 " A E G 82935	
One two phased alternating current machine	
E. S. D. L. 750/40 40 K. V. A 250 volt	
normal 280 volt maximum	
750 turns, 50 periods with pulley 560,280	
1 set of fundament rails	
1 case gross 40 net 185 Kg. A. F. G8560	
1 Magnetic regulator	
1 case 1 crate Gro. 389 Kg.	
1 self supporting marble switchboard.	
1 900,700 25 Mm with wood frame and wall	
anthars	
2 Perforated steel sheets	
2 Dynamometrical precession voltmeters	
12449	
2 Dynamometrical precession ampremeters	
12457	
2 Double poled switches with covers 17205	

2 Double poled safety fuses 10631 with  
cover and welding insertions 11105.

Total amount marks . . . . . 3290.00

Consul's fee for legalizing invoices . . . . . 10.60

Marks . . . . . 3300.60

3300.60 marks is equal to American money,

\$785.54 "

Q. 21. What is the year referred to in this book?

A. 1904,—no; I don't know that. I have to guess at that. These bills might have come with the machine or before or after the machine. You will have to be governed by the dates on the entry of the bill. That would be better than guessing at it. How could I remember fourteen years ago?

Q. 22. What is the year referred to in this book?

A. 1904 or 1905; I don't know which. I would have to post myself on that. This is the bill book for 1905, I see by referring to the back of the book where it bears the legend in gold letters stamped on the cover, "Bill Book. 1905. N. E. & S. Co."

Q. 23. How soon after you returned from Germany did the machinery which you bought there arrive in this country?

A. To the best of my knowledge, it was about six weeks.

Q. 24. After this machinery arrived, what did you do with it?

A. We put it up in the factory and started to work it.

Q. 25. What sort of work did you use it for?

A. Electric welding of handles and spouts and lips on coffee boilers and ears on kettles and everything for which it was applicable.

Q. 26. Have you one of these machines now?

A. I have both of them, but one of them has been somewhat altered. It was a foot machine and we altered it to run by power. But we have one that is in its original state as it came to us.

Q. 27. After you returned from Germany, did you make any report of your work in Germany to your company?

A. I wrote a letter to the president, thinking he might be interested in what we had done and how we had spent the company's money. I wrote him a letter of which I found a copy the other day [*handing copy to counsel*].

Q. 28. What is the date of this report?

A. January 3, 1905.

(Copy of report handed to counsel for defendant for inspection.)

Q. 29. Did you ever get any drawings of these machines?

A. Yes; the company furnished me with the working drawings of the two machines that they gave me with the contract.

Q. 30. Can you produce those drawings?

A. Yes [*producing drawings and handing to counsel for plaintiff*].

Mr. ARVEDSON. Counsel for complainant now offers in evidence the drawings produced by the witness, and they are marked "Plaintiff's Exhibit No. 8, Drawings of Machine Bought by National Co. from Silesia Co., A. B. C."

(NOTE. It is stipulated by and between counsel for the respective parties that photostatic copies may be used in evidence in place of the original drawings, with the same force and effect as the originals, subject to the production of the originals for comparison and correction, if desired.)

Q. 31. Where have these drawings been since you first received them?

A. They have been in this office,—in the office of the National factory at Baltimore ever since we received them.

Q. 32. Were both the machines which you bought of the same type?

A. No; one has a vertical movement and the other has a circular movement, a movement in a sector. Otherwise the machines are alike.

Q. 33. What have you done with these machines since you first received them in this country and since you put them into use?

A. We have been using them ever since we received them and they are still in use.

Q. 34. Have you ever made any other machines of this sort?

A. Yes; we have made a considerable number of these machines off of the drawings and by using the first two machines that came as patterns.

Q. 35. Do you know how many machines in all you have made?

A. I imagine we have made upwards of one hundred.

Q. 36. Were all of these machines used in this factory, or in some of your other factories?

A. Some of them were shipped to the other factories of the National Company, to New York and St. Louis and Milwaukee and New Orleans.

Q. 37. For what sort of work were these machines used by you?

A. Putting on spouts, handles and lips, and all such stuff as has been heretofore riveted on.

Q. 38. Were there any savings or other advantages?

A. Yes, there was considerable saving in the welding over the riveting.

Q. 39. What were some of these savings?

A. As much as sixty-six per cent, probably more in some cases. They changed the class of labor used. You could work the welding machine with inferior labor, where it would take a skilled operator to rivet. There is where we saved something, beside the cost of the rivets.

Q. 40. You have spoken of using unskilled labor for this work; how unskilled do you mean?

A. Well, what we call ordinary labor we could teach inside of a half an hour how to work an electric welding machine, where it would take three or four days before a man could learn how to rivet,—sometimes longer than that.

Q. 41. What are the ages of some of the employees who do this work?

A. We cannot work them under sixteen.

Q. 42. Do you have any employees who are on this work now; and, if so, what are their ages?

A. The boys who are running them now, especially the one that was running them yesterday, was under sixteen, but we have a permit from the Bureau of Labor and Statistics for him to work, and they only work eight hours. You can run it with that class of labor.

Q. 43. Will you please compare the advantages and disadvantages of riveting with welding with these machines?

A. The advantages of welding are these: You get your work very much faster from the operator; you save the rivets that you



had used theretofore, and you save in the different class of labor, as I mentioned before ; you can use cheaper labor.

Q. 44. Will you compare riveting with welding with reference to enameling, if you please?

A. This electric welding applies more to sheet iron than anything else. In enameling when we rivet ware such as enamel ware, when we rivet on handles and spouts and the like, the enamel would jump off the heads of the rivets on the inside of the article after it was enameled, where the electric welding obviated all that. This applies to enameled ware, of course.

Q. 45. Are there any other advantages of enameled welded ware over enameled riveted ware?

A. Only the appearance ; it looks nicer. That is the only advantage I know of.

Q. 46. In what way does it look nicer?

A. You do not have the projecting rivet or the head of the rivet showing ; it makes a smooth finish.

Q. 47. Where is Mr. Haberman, whom you have referred to?

A. He is now living at the Waldorf Hotel in New York when I last heard of him.

Q. 48. Do you know how old he is and what his health is?

A. I think the old man is about eighty. He is in pretty bad health. He is a very feeble man ; he is not now in business.

Q. 49. Who installed these machines in this factory?

A. I did.

Q. 50. I mean what workman installed them?

A. We have an electrician, a foreman.

Q. 51. What is his name?

A. William A. Herring.

Q. 52. Is Mr. Herring acquainted with the manufacture of other machines which this company has built?

A. He knows about all machines that we have used in this factory, also the two machines in question. He was here when the machines were installed in this factory.

## Cross Examination.

By Mr. CHURCH.

×-Q. 53. Mr. Knapp, your company to some extent still employs rivets instead of electric welding?

A. Yes.

×-Q. 54. How many riveters do you employ?

A. I do not believe we have any now, today. I do not think there are any riveters in the house today, as there is not sufficient riveting done to keep a corps of riveters such as we did keep at one time, owing to the change of affairs in our factory. We do not use as many riveters as we did use heretofore.

×-Q. 55. Leaving out of consideration other advantages or disadvantages, is not a rivet a stronger mode of connection than an electric welding connection?

A. No; you have to qualify that to some extent. If it were a small rivet and a small weld, one would be as strong as the other, but I do not know how far you could take that and measure the strength if the rivets were brought up to two inches in diameter. You have got to draw your electric welding in proportion. That is a little technical to answer that question. The ordinary welding in a tin factory is just as strong as the ordinary riveting that has been done heretofore. Of course we use little bits of rivets. But if you get to a big rivet like that [*indicating approximately two inches*], you could weld it down like these fellows do who weld rivets in building ships. I don't know that you could ever get it any stronger.

## Redirect Examination.

By Mr. ARVEDSON.

RDQ. 56. What sort of work do you use riveting on?

A. We use rivets for tin work, not black work at all. Electric welding is not fit for tin, but it is fit for all kinds of iron work, sheet iron and sheet steel. We make enameling out of sheet iron and sheet steel, and the same way with Japan work.

RDQ. 57. Will you explain this a little further, if you can?

A. To weld tin ware it makes a black spot and burns the tin and in sheet iron or sheet steel it does not make that spot. The

extreme heat at which the welding is done does not interfere at all, where it would burn tin.

*RDQ. 58.* Are there any other differences between the ware that is welded and the ware that is riveted?

*A.* Only in appearance; that is the only difference I know of in the finished ware.

*RDQ. 59.* How many factories has this company which use the welding process which you have testified about?

*A.* We have two factories in Baltimore, Maryland, two in St. Louis, one in Milwaukee, one in New Orleans and one in New York.

*RDQ. 60.* What is the usual size of the rivets that you use?

*A.* We use from 16-ounce to 2-pound, with all intermediate sizes. When I say 16-ounce rivets I mean 16 ounces to the thousand rivets. That is the way we designate the sizes.

*RDQ. 61.* Are you willing that Mr. Church see that original machine which you have here in the factory?

*A.* Yes.

(Counsel and witness adjourned to the factory to examine the machines.)

*RDQ. 62.* Have you shown the original machine that you obtained in Germany to Mr. Church?

*A.* I did show him the original machine that came from Germany.

#### Recross Examination.

By Mr. CHURCH.

*R × Q. 63.* I noticed that the electrodes in the machine were not tapered, but were blunt at the ends, as are the electrodes shown in the drawings which you produced here this morning; are those electrodes now in the machine like those that you ordinarily use in connection with the machine?

*A.* No; we changed the electrodes. If I want to make a nice neat job I taper the electrode. You have to do it to get nice, neat work. The points wear off and they do not put them on any more.

*R × Q. 64.* But the fact is that the electrodes now in the machine are blunt and not tapered. Is that not true?

*A.* Yes.

*R × Q. 65.* And the fact also is that the electrode shown in the drawings which you have produced are blunt and not tapered?

A. Yes.

(Testimony of witness concluded.)

GEORGE W. KNAPP.

Thereupon WILLIAM A. HERRING, a witness of lawful age, produced on behalf of the plaintiff, being first duly sworn to testify the truth, the whole truth and nothing but the truth, deposes and says as follows : —

Direct Examination.

By Mr. ARVEDSON.

Q. 1. Please state your name, age, residence and occupation.

A. My name is William A. Herring ; my age is fifty ; my occupation is electrical engineer ; I live at 221 North Lakewood Avenue, Baltimore, Maryland.

Q. 2. How long have you been working for the National Enameling & Stamping Company ?

A. Approximately twenty-six years.

Q. 3. Did you see the machinery purchased by Mr. Knapp when he was on his trip to Germany ?

A. I saw the machines when they arrived, when they were brought to the plant here in their original cases.

Q. 4. Did you have any way of knowing that this machinery which you saw came from Germany ?

A. Only by certain marks on the box ; certain marks on the boxes which were hermetically sealed. I do not know definitely that they came from Germany only from those marks.

Q. 5. Can you tell me in a general way the approximate time of the arrival of this machinery, whether it was two years ago or four years ago, or how many years ago it was ?

A. I judge it was about five years ago. I may be mistaken on that ; that is only approximate.

Q. 6. Have you any way of fixing that time ?

A. Only by invoices which Mr. Knapp has, or the bill of lading.

Q. 7. What connection did you have with these machines after they came ?

A. I erected them and operated them.

Q. 8. You have spoken of some machines that came from Germany ; is any one of those machines in this plant now ?

A. The machines that I refer to are the ones that are in the plant now.

Q. 9. Is any one of these machines in substantially its original condition still?

A. I would say that there has been some little drilling and so forth on them, but outside of that they are in their original condition.

Q. 10. Where is that machine located?

A. It is in the portion known as the welding room.

Q. 11. Which machine in the welding room is this particular machine that you have reference to?

A. The one I have reference to that shows the greatest originality is the one in the welding room. There is another in the enameling room, building No. 6, and on that machine the castings and so forth are part of the original German machine.

Q. 12. There are several machines in the welding room; which one of the machines in the welding room is the original machine that you have spoken of?

A. The one that I refer to as the original machine in the welding room is the one which appears to have the lowest stand. I would refer to that particular machine also as a rotary machine that is now in the welding room, that being the only one there.

Q. 13. What do you mean by "rotary"?

A. It moves in an arc, in a rotary manner instead of a vertical line.

Q. 14. Will you explain a little further what you mean by a rotary machine?

A. The motion of this particular machine in accomplishing its work is a rotary motion; it moves in a circle and not in a vertical line.

Q. 15. What part moves in a circle?

A. The part known as the head, carrying the top electrode.

Q. 16. Was the other machine which is no longer in its original condition a plunger type or a rotary type of machine?

A. Plunger type.

Q. 17. Do you know if this company, the National Enameling & Stamping Company, has built any other machines similar to either of these two types you have referred to?

A. Yes, they have.

Q. 18. Can you give an estimate of the number of these machines which have been built?

A. I would judge from eighty to one hundred. The sum total of the machines built would consist of the two types.

Q. 19. Were these machines built for use by this company alone or for others?

A. As far as I know, I could not answer that question.

Cross Examination.

By Mr. CHURCH.

X-Q. 20. In my examination of the machine in the welding room today I noticed that the electrodes were blunt and not tapered; were the electrodes in the machine as it came originally like that?

A. Yes, blunt.

Redirect Examination.

By Mr. ARVEDSON.

RDQ. 21. Are the electrodes perfectly flat?

A. They have a tendency, especially the lower one, to wear slightly round, due to moving the work about, especially when work is put on there of a circular nature; they are, as a general thing, flat.

RDQ. 22. What do you mean by "as a general thing"?

A. If I were to install a new electrode and make a point for it, I would just simply leave it flat.

RDQ. 23. How long does it stay flat?

A. Not very long; probably in the course of a day it would wear in the shape of the work.

RDQ. 24. How long do the electrodes last?

A. The lower electrode will last, by fairly constant use ten hours a day, it will last three months. The upper electrode will last a year.

RDQ. 25. How long does the upper electrode remain flat?

A. Constantly.

(Testimony of witness concluded.)

WILLIAM A. HERRING.

District Court of the United States, Eastern District of Michigan,  
Southern Division. In Equity.

THOMSON SPOT WELDER COMPANY, Plaintiff,

v.

FORD MOTOR COMPANY, Defendant.

On Harmatta Patent No. 1,046,066.

Evidence for the plaintiff taken under the Revised Statutes of  
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agreement of counsel. Before me,

HECTOR M. HOLMES,

[SEAL]

*Notary Public.*

Met pursuant to agreement of counsel at the office of Fish, Rich-  
ardson & Neave, 84 State Street, Boston, Mass., at 10.30 A. M.,  
November 5, 1918.

Present: J. L. STACKPOLE, Esq., of Counsel for Plaintiff;

MELVILLE CHURCH, Esq., of Counsel for Defendant.

GEORGE A. CUTTER, having been duly sworn, deposes and says  
as follows:—

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation.

A. George A. Cutter; 44 years; 201 Millage Avenue, Dedham,  
Massachusetts; vice-president and general manager Thomson Elec-  
tric Welding Company and Thomson Spot Welder Company. For  
a year or more I have acted as the chief executive of both of the  
Thomson companies in the absence of the president, Major J. W.  
Farley, who is now in France. The treasurer, Mr. Elliott Farley,  
is also in the United States service and is at present stationed at  
Florida. I am also a director of both of the Thomson companies  
and a member of the executive committee of each company.

Q. 2. How long have you been connected with the Thomson  
companies and in what capacity?

A. With the Thomson Electric Welding Company since the  
spring of 1916, first as acting general manager, then as general  
manager, vice-president, etc. With the Thomson Spot Welder  
Company since its formation, first as treasurer and general mana-



ger and director and then as vice-president, general manager, director, etc.

Q. 3. Does the Thomson Spot Welder Company manufacture and lease spot welding machines?

A. It does.

Q. 4. Can you produce a catalogue illustrating some of the spot welding machines manufactured and leased by the Spot Welder Company?

A. Here is a series of bulletins describing and illustrating the principal machines in the line. The company makes and leases other sizes of spot welders in addition to those shown.

(Counsel for plaintiff offers in evidence the series of bulletins produced by the witness, and the same are marked "Plaintiff's Exhibit No. 9, Thomson Spot Welder Bulletins".)

Q. 5. What are these bulletins numbered?

A. Bulletin No. 201, Bulletin No. 203, Bulletin No. 204, Bulletin No. 205.

Q. 6. Can you produce a couple of electrodes such as are illustrated in some of the spot welding machines of Plaintiff's Exhibit No. 9?

A. Here are two ordinary electrodes such as are customarily used in some of the machines illustrated in the bulletin. The electrodes, however, vary considerably in shape according to the nature of the work to be done, and in dimensions. For instance, in many kinds of work the upper electrode is longer than the lower electrode. In certain instances the bevelled portion makes a more acute angle with the axis of the electrode.

Q. 7. About how many spot welder machines have the Thomson Company got out under lease or license?

A. Approximately, 1,000. This covers in a general way two classes of machines; one class which was built by the Thomson Company and the other class machines which were built by other companies and to operate which the Thomson Spot Welder Company has granted licenses.

Q. 8. About how many spot welders a year would be made by these machines in the course of their normal employment at fair capacity?

A. If these machines were all run at a fair average capacity for

nine hours a day, 308 days per year, they would produce upwards of two and one-half billion spot welds per year. Inasmuch as the machines licensed vary greatly in size and speed of operation, in order to make an estimate of a fair average capacity per machine I have taken as a standard current practice in the manufacture of various automobile parts and have taken average of fifteen or twenty or more different operations, and have used as a base figure thus obtained 973 welds per hour per machine.

Q. 9. Will you produce a list of spot welding machines under lease or license from the Spot Welder Company, giving the names of the licensees, the number of machines for each one and the general purpose for which the machines are licensed?

A. Here is a such a list marked "Partial list of licensees" giving number of machines and uses covered by license under Harmatta patent, dated October 30, 1918. This list was prepared under my direction by employees of the Thomson Spot Welder Company and was obtained by going over the licensors' copies of signed license contracts. In the column headed "Use" we have given what we understand to be the product for which the machines are or may be used. In many cases we have copied the uses directly from the license contract. In other cases the license gives the right to use or perform the Harmatta process for any purpose with certain exceptions, which are shown on the rider on page 18.

(Counsel for plaintiff offers in evidence the two electrodes produced by the witness, and the same are marked "Plaintiff's Exhibit No. 10A", and "No. 10B, Sample Electrodes of Plaintiff's Spot Welding Machine".)

(Counsel for plaintiff also offers in evidence the list of spot welder machines produced by witness, and the same is marked "Plaintiff's Exhibit No. 11, List of Licensed Spot Welder Machines".)

#### Cross Examination.

By Mr. CHURCH.

X-Q. 10. Approximately, how many butt welding machines or electric welding machines other than those especially adapted for spot welding has Thomson Electric Welding Company or Thomson Spot Welder Company leased or sold during the period in which

the thousand spot welding machines that you have referred to have been leased or licensed?

A. The greater part of the machines covered on the list have been licensed since the formation of the Thomson Spot Welder Company about November, 1916, or in approximately a two-year period. The Thomson Electric Welding Company has probably sold or leased between two and three hundred electric welders during the last two years. This figure may be somewhat larger or smaller, as without consulting the records of the company I cannot give a more definite answer.

X-Q. 11. How many spot welding machines has the Thomson Spot Welder Company actually made and licensed during the two years of its existence?

A. Without consulting our records I place this at approximately five hundred.

X-Q. 12. Approximately, then, about 50 per cent of the thousand machines referred to by you as having been leased or licensed by Thomson Spot Welder Company were spot welders that had been previously made by Thomson Electric Welding Company or other manufacturers. Am I right about this?

A. I believe that this is approximately correct.

X-Q. 13. Can you and will you produce bulletins or catalogues of the Thomson Electric Welding Company covering the same period as the bulletins or catalogues of the Thomson Spot Welder Company embodied in Plaintiff's Exhibit No. 9?

A. Yes, I can and will.

(Counsel for defendant requests that the witness when convenient hand to the counsel for complainant the bulletins referred to, and that the examiner mark the same "Defendant's Exhibit XX".)

X-Q. 14. During the last ten years has there not been a great development of electric welding, both butt welding, so called, and spot welding, so called?

A. There has been a considerable development in a commercial way.

X-Q. 15. How long has Thomson Electric Welding Company been engaged in the manufacture and sale or leasing of electric welding machines adapted for spot welding, so called?

A. When I first became connected with the Thomson Electric Welding Company the business of manufacturing and selling or

leasing electric welding machines adapted for spot welding was practically at a standstill. I was informed that the company had previously manufactured and leased or otherwise disposed of either directly or through another company having certain sales rights a hundred or more spot welders. Without consulting the records of the company I cannot state when the company first started to put out such machines.

×-Q. 16. How long have you been connected with Thomson Electric Welding Company in any capacity?

A. Since the spring of 1916.

(Deposition closed. Signature and certificate waived.)

Adjourned to the same place on Monday, November 11, at 2 P. M., when the plaintiff gives notice that the deposition of James H. Gravell will be taken on behalf of the plaintiff.

Met pursuant to agreement of counsel at the office of Fish, Richardson & Neave, 84 State Street, Boston, Mass., at 2 o'clock, November 11, 1918.

Present: J. L. STACKPOLE, Esq., of Counsel for Plaintiff.

MELVILLE CHURCH, Esq., of Counsel for Defendant.

*Second Deposition of James H. Gravell.*

Direct Examination

By Mr. STACKPOLE.

Q. 1. Are you the James H. Gravell who has already testified in this case?

A. Yes.

Q. 2. Have you read the deposition of Frank L. Dyer given on behalf of the defendant herein, and read the patents to which Mr. Dyer refers?

A. Yes.

Q. 3. Please compare the disclosures of the Harmatta patent in suit and of the Harmatta first original application for that patent, and state whether or not you find that they describe the same process.

A. The Harmatta patent No. 1,046,066 describes exactly the same process as is described in Harmatta's original application.

Harmatta's patent describes (page 1, line 10) "a novel means of fastening the component parts" together by a process of electric

welding. This process "affords a cheap and practical substitute for riveting". The process is not a makeshift or a different means which can be used for obviating the use of rivets, but from a practical standpoint is to all intents and purposes a rivet or what might be termed an electric rivet. It has, however, a decided advantage over rivets because "there are no rivet heads to mar the finish of the back or outer surfaces of the plate". According to Harmatta, his electric weld or what we have termed his electric rivet was "particularly useful in fastening plates or strips of metal to one another inasmuch as it may be employed for the thinner sheet metal, such, for instance, as is used for sheet metal ware like vessels or household utensils".

Harmatta's original application had exactly the same object in view and described the same kinds of welds which we have termed electric rivets. Quoting from the original application we find that the weld Harmatta describes "perfectly answers the purpose of a rivet" and is especially useful "in the case of thin vessels". These welds, the same as rivets, occur "intermittently or at certain spots only".

In both Harmatta's patent and the original Harmatta application the fundamental ideas were the achievement of a small, well-defined electric weld which not only would act a rivet but would be an improvement over rivetting.

To carry out this idea of welds which would perfectly answer the purpose of rivets Harmatta describes in his patent No. 1,046,066 a method or process. Like the method of rivetting Harmatta first overlaps the two sheets of metal, as he shows in his Figure No. 1 (page 1, line 26), "in their juxtaposed" position. This overlapping of the work is described by Harmatta throughout his patent (page 1, lines 26, 27; page 2, lines 9, 10).

Harmatta's original application also describes this overlapping of the parts to be attached by his electric rivet and illustrates it in his Figure No. 1. In the original application in describing Figure No. 1 he tells us that "the two sheet metal or other bodies, the edges of which lie upon each other, are introduced between the two electrodes *a* and *b*".

As far as the overlapping of the work goes, both the patent and the original application absolutely agree as to the direction of over-

lapping the work and both patent and application show the same illustration.

After overlapping the sheets Harmatta in his patent tells us that he concentrates his welding current and his welding pressure at any spot over this overlapped portion. Reading through the patent we find such passages as (page 1, lines 26, 27): "their juxtaposed or opposing plane surfaces by application of pressure and heating current localized in such spots". (Page 1, line 76:) "The desired pressure and heating current at any desired distinct small spot or area." In fact, all through the patent references are made to his ability and to this step in his process to concentrate the heat and pressure at any spot over the overlapping portions of the work.

The same step in the process is equally evident in Harmatta's original application. We find that the same tools are used for applying both the electric current and the pressure to the work. Harmatta tells us "the new process consists in one of the electrodes (or both of them) not only serving to feed the current, but also being employed for exercising a more or less strong pressure". These electrodes are arranged "directly above the surface or point to be welded". The point to be welded is of course any point over the overlapped portion of the work.

According to Harmatta's patent, the next step in the process consists of heating the work in the line of the current and pressure. After positioning his tools so as to apply the current and pressure to the desired spot, "the place of welding is brought to the proper temperature". He tells us that effective welding such as is accomplished by his process ordinarily results when the work is "well hammered or pressed". In other words, the welding tools "may each be adapted to work on the smallest possible surface contact so as to localize the pressure and the path of the heating current to a very small spot only". This production of a heated path directly through the overlapping sheets from one tool to the other (Figure No. 1) is further described by Harmatta (page 2, line 50): "thus producing a flow of heating current through the work itself substantially localized therein so as to bring the same to the necessary welding temperature at the desired spot only".

Harmatta describes this step in his process in his original application, that is, the heating of the work in line with its pressure and

current. "The member which feeds the electricity is thus at the same time the tool, and in this manner the most favorable conditions of working possible are secured, since as is well known in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough". He tells us that never before his process has the pressure been exercised "by means of the electrodes located in the direction of the current directly above the surface or point to be welded".

Both the patent and the original application agree in that step in the process where the work is heated in line of the current and the pressure.

The last step in the process according to Harmatta's patent consists in welding the parts together without modification or without mutilating or damaging the material. He tells us in the patent that his process results in (page 2, line 56) "the welding of the plates together in the small sharply defined place of welding at the point or spot desired which perfectly answers the purpose of a rivet". He also tells us (page 2, line 85) that there is an "absence of burning, roughening or disintegrating of the backs of the plates". It stands to reason that no modification or mutilation of the plates would be tolerated in a process which was to be an improvement over the old-fashioned rivet and no proof of the absence of modification is better than the fact that the process has in many cases entirely superseded riveting.

In his original application Harmatta could not tell us better that he does not mutilate his work than by advising us that his welding "perfectly answers the purpose of a rivet", for any process which mutilated or scarred the work could not be considered by the trade which was used to the smooth finish of riveted joints.

The steps in Harmatta's patent consisting of (1) overlapping the sheets; (2) concentrating the current and pressure at any spot over the overlapping portions; (3) heating the work in the line of current and pressure; and (4) welding the parts together without modification, are plainly evident in Harmatta's original application. And Figure No. 1 of Harmatta's patent, which shows the arrangement of the parts for carrying out this process, is identical with Figure No. 1 of the original application, which shows the arrange-



ment of parts for carrying out the process as described in the original application.

Harmatta in his patent tells us that his process is an electric welding one, that is, his process is electric welding. If we inquire into the meaning of this term "electric welding" we find that the term was invented by Professor Thomson to describe his invention which he covered by patent No. 347,140. This invention was the fundamental patent on electric welding, and in it Thomson says (page 1, line 30): "The new art, which I term 'electric welding'". This new art consists in passing large volumes of current through the work for the purpose of heating it at the joint to be united, when on the application of pressure one part is forced into the other causing a weld. One of the characteristics of this electric welding process, which was carried out strictly according to Thomson's ideas, is the formation of a burr or upset due to the application of pressure to the parts being welded. Another characteristic of electric welding, according to Thomson, is that the work being heated constitutes (page 3, line 11) a large fraction of the total resistance of the welding circuit. According to Thomson, nothing is transmitted to the work except electricity and pressure,—that is, the heat is wholly developed within the work. Harmatta in his patent goes to considerable pains to tell us that his invention lies in the electric welding field and is a special form of electric welding.

Electric welding was a well-known art from a commercial standpoint at the time of Harmatta's application. It was well known at that time that cold electrodes applied the electricity to the work, and that these electrodes pressed the work together. There was therefore no need for Harmatta in his original application of his patent or in the finished specification of his issued patent to describe fully and in detail all the characteristics of electric welding. It was sufficient only to say that his invention was "electric welding" for those skilled in the art to understand the general characteristics of his process. As soon as he said that his invention related to a novel means of fastening the component parts of the work together by a process of electric welding, all those skilled in the art immediately realized that nothing was transmitted to the work except electricity and pressure, and that all heat used in the process was developed within the work itself by the passage of the current.

through the work. For fear, however, that he might be misunderstood, Harmatta explains in his patent what he means and what is meant by the term "electric welding" by saying: "I mean that well known process in which the work is brought to a welding temperature by internal heat generated by the resistance of the work itself to the passage of an electric current at the place of contact between the parts joined by the welding pressure."

Harmatta's original application is very clear in assigning the invention to the category of "electric welding". In his first paragraph he tells us that he has invented something new and useful in electric welding. In his third paragraph he tells us about electric welding and some of the things which he thought were novel with him, so that there is no doubt in the inventor's mind that he is dealing with the true electric welding process in which the heat is developed within the body of the work. It is well to note in the original application that the inventor applies nothing to his work except electricity and pressure.

Both Harmatta's patent and his original application describe a true electric welding process where nothing is applied to the work except electricity and pressure and all heat employed in the process is developed within the work by the passage of electricity through the work.

Although Harmatta's patent describes the true electric welding process, it differs in some respects from the conception of the art. One of these differences lies in the fact that Harmatta concentrates his current by means of the electrode. Figure No. 1 of Harmatta's patent shows the shape of the electrode used by Harmatta. This pointed electrode shown by Harmatta constitutes a special method of localizing the current by concentrating it directly to the spot to be welded (page 1, line 29). Harmatta describes this tool or electrode by telling us that the "tool pressed against the work" is "formed so as to engage the work by a spot or area of small extent" (page 1, lines 75-88). According to Harmatta, the "electrodes *a* and *b* of Figure No. 1 are by preference both formed to engage the work by a small area of contact and may each be adapted to work on the smallest possible surface contact so as to localize . . . the path of the heating current in a very small spot only". Harmatta's Figure No. 1 clearly shows this concentration of the current by

means of the electrode. Figure No. 2 shows the same thing, and this is likewise true of Harmatta's Figures No. 3 and No. 4.

In Harmatta's original application he tells us that the electrodes press on the place to be heated (third paragraph) and that these electrodes are pin-shaped, "the form of which may be suited to the particular purpose in view and which may be adapted to work on the smallest possible surface contact". These electrodes he shows in Figure No. 5 so that we can clearly see that these electrodes concentrate the current at the spot to be welded. The electrodes of Figure No. 5 are described as "having the form of pins". It should be noted that Figure No. 1 and Figure No. 5 of Harmatta's original application show these pointed or pin-shaped electrodes for concentrating the current and that these figures are identical with Figures Nos. 1 and 2 of Harmatta's issued patent, which also show pointed electrodes for concentrating the current.

Not only does Harmatta concentrate his current by means of pointed electrodes in his patent, but the same pointed electrodes act as pointed mechanical tools for concentrating the pressure used in welding. Harmatta in his patent tells us that the weld is "made by using a tool pressed against the work by its end and formed at such end so as to engage the work by a spot or area of small extent and serving likewise, by preference, as the electrode which feeds the current into the work to heat the same. The member which feeds the electricity being thus at the same time the tool . . .". This tool and electrode combined which is shown at *a* in Harmatta's Figure No. 1 in order to concentrate the pressure as well as the current "are by preference formed to engage the work by a small area contact" (page 2, lines 24-27). By tapering or pointing his electrode Harmatta directs all the pressure used in his process to the small spot or area which he desires to weld.

In Harmatta's original application this same method of using the tool which concentrates the pressure as an electrode is carried out. In describing his process in his original application he tells us that the electrodes not only serve to feed the current, but are also employed for exercising the required pressure (second paragraph). These electrodes Harmatta shows in his Figures Nos. 1 and 5 (original application) as "pin-shaped" so that there is no doubt regarding the concentration of the pressure by means of these agencies.

Both Harmatta's patent and his original application describe pointed electrodes which are used for concentrating the pressure.

According to Harmatta's patent, when this concentrated current and pressure is applied to the work, as shown for instance in Figure No. 1, the current remains localized as it passes through the work (page 2, lines 50-52), so that the work only becomes heated directly beneath the electrode or between the electrodes as shown in Figure No. 1. It should be noted that the place heated for welding, that is, the portion directly between the electrodes *a* and *b* in Figure No. 1, is entirely surrounded or enclosed by relatively cold metal. The electrodes which supply nothing to the work except electricity and pressure are necessarily cold and the work itself, except directly between the electrodes, remains cold and it is therefore self-evident that the metal heated for welding is entirely surrounded or enclosed by this relatively cold metal.

In Harmatta's original application he tells us that the "electrodes are located in the direction of the current directly above the surface or point being welded" and he illustrates this condition in Figure No. 1 of his original application. On closing the circuit "a small round very sharply defined place of welding is caused" between the electrodes in the path of the current, and it requires no exercise of the imagination to realize that this metal heated for welding must be entirely enveloped by relatively cold metal; that is, on the top and bottom of the work the hot metal is bounded by the cold tool and through the body of the work the hot metal is bounded by the cold metal of the work itself.

Both Harmatta's patent and his original application clearly indicate that the metal heated for welding is entirely surrounded by relatively cold metal.

As the metal heated for welding is entirely surrounded by relatively cold metal in Harmatta's process, the heat is conducted away from this hot spot very rapidly because the hot metal is in unbroken contact with the cold metal and the weld must be made very quickly or it cannot be made at all; that is, the energy applied to the work for raising its temperature must be applied quickly, as otherwise the energy will leak away more quickly or as quickly as it is supplied. The condition is very similar to filling a leaky tank with water, for unless we fill it at once we cannot fill it at all, as the

water flows out as quickly as it is put in. The quickness of the process is especially noticeable in the thinner grades of metal, such for instance as is used for cooking utensils, where Harmatta tells us in his patent it requires but a moment, that is, at the right moment the pressure may be exactly regulated.

In Harmatta's original application he follows practically the same wording regarding this momentary action and, quoting from his last paragraph next to the claims, he says: "The pressure on the place of welding may at the right moment be exactly regulated or kept within the proper limits."

Both Harmatta's patent and his original application refer to this momentary action of his process, when carried out on metal suitable for cooking utensils.

(Adjourned to November 12, 1918, at 9.30 A. M.)

BOSTON, November 12, 1918, 9.30 A. M.

Met pursuant to adjournment.

Present, counsel as before.

Mr. Gravell continues his answer to Q. 3.

One of the beauties of Harmatta's patent, or the process of the Harmatta patent, is the welding of the work without modification or scarring or mutilation. It is the absence of these things which makes the process so popular commercially, for after the actual welding is completed the article can be considered as finished. In the original Thomson process, as we have already noted, one of the characteristics was the formation of a burr or upset which in most cases had to be removed after the welding was completed in order that the object welded would have a presentable appearance and would be suitable for the purpose for which it was produced. This absence of burr was characteristic of the process Harmatta describes in his patent. The process, according to Harmatta (page 1, line 15), "is particularly useful in fastening together plates or sheets of metal to one another inasmuch as it may be employed for the thinner sheet metal, such for instance as is used for sheet metal ware like vessels or household utensils". This type of vessel was very well known in the trade previous to Harmatta's patent and the parts of which, previous to Harmatta's patent (or rather previous to the time his invention became known), were attached by rivets.

The process of rivetting was inexpensive and produced a reasonably good finish and unless Harmatta's process produced a better finish it certainly would not have been adopted, even though it was a cheaper process than rivetting. This advantage of the process over rivetting Harmatta points out (page 2, line 83): "sheet metal work made by this process is readily distinguished from that made by prior processes by the comparative absence of burning, roughening or disintegrating of the material on the back of the plate". This lack of modification in Harmatta's process is due to a great extent to the arrangement of his electrodes, as shown in his Figure No. 1. By this arrangement the metal heated for welding, as we have already noticed, is entirely enclosed by relatively cold metal and therefore cannot extrude and form the burr.

Harmatta's original application shows exactly the same arrangement of the work and the electrodes in Figure No. 1 of his application, showing that in the application also the metal heated for welding is entirely enclosed and therefore cannot extrude and form a burr. And, knowing this, Harmatta tells us in his original application that his weld (last paragraph) "*perfectly* answers the purpose of a rivet".

Both Harmatta's patent and Harmatta's original application disclose the fact that no modification of the work is involved in the process.

It should be noted that in the old-fashioned riveting process the parts being attached do not move in relation to each other during the process; that is, one part does not move toward the other part. This of course is self-evident. In rivetting therefore it is possible to accurately fit the parts together before processing and after processing the parts will remain unchanged in their relative position. Harmatta's spot welding process, or his process which produces what we have called "electric rivets", possesses this characteristic of rivetting. In Harmatta's process the parts are assembled exactly in the position required in the finished article and after processing the parts remain in exactly the same relative position. This can easily be appreciated by examining Figure No. 1 of Harmatta's patent. The parts according to Harmatta are lapped and in contact and the tendency of the welding tools is to force the parts together, but as the parts are already in overlapping contact and as the tools

only operate at a small spot over the overlapping portions it is impossible that the tool move the parts together any further.

This same characteristic is disclosed in Harmatta's original application. He tells us (last paragraph) "A small round very sharply defined place of welding is caused which perfectly answers the purpose of a rivet." His weld could not possibly answer the purpose of a rivet if the parts of the work being attached moved in relation to each other during the welding operation. The Harmatta original application clearly discloses this fact in his Figure No. 1.

Both the Harmatta patent and the original application disclose the fact that the parts being welded remain stationary in relation to each other during the welding operation.

We have already noted that the term "electric welding" was coined by Professor Thomson to describe his process. In this process large massive copper clamps gripped the bars to be welded together. This process was in extended commercial use prior to Harmatta's invention and it was general knowledge to all those skilled in the art that these copper clamps must be kept cool, and where large welding currents were used a water circulation was provided through the clamps. These clamps or electrodes of Thomson were really vises, and it does not require any more than common sense to know that a red hot vise is of very little use owing to the fact that as the metal becomes heated it becomes softer and will not stand the strains required of a vise. Harmatta's electrodes differ, however, from Thomson's electrodes, in that they are not vises but yet they transmit the pressure to the work and are therefore subject to strains, and the same common sense applies to Harmatta's electrodes as to Thomson's electrodes, that is, if they are to transmit the pressure, which Harmatta says they do (page 1, lines 76-88), they must be cold. It is especially true in Harmatta's process that the electrodes must be kept cool because the electrodes are pointed and a heated point is very hard to maintain, and if the first weld heated the electrodes it would cause them to become blunt and would be entirely worthless for the purpose when trying to make a second weld; yet Harmatta tells us (page 2, line 65) "the operation may be repeated upon the work at another point if it is desired to join the pieces at a number of spots".

In Harmatta's original application he discloses the fact that his



electrodes are cold by telling us that his invention is electric welding and corroborates this by telling us that the electrodes (second paragraph) "not only serve to feed the current, but are also employed for exercising a more or less strong pressure". He also tells us that the welding may be done (first line, third page) "intermittently", implying that the same tool may be used repeatedly to form welds; this certainly could not be the case if the tool became heated to any extent in making the first weld.

In both Harmatta's patent and the original application the process involves the use of electrodes which remain practically cold during the welding operation.

Harmatta's weld corresponds in size to a rivet. It necessarily must do this as he tells us that his invention is devised for replacing rivets. Referring to Figure No. 1 of Harmatta's patent, it will be noted that the path of the current produced by the electrodes corresponds in size practically to the shaft of a rivet suitable for uniting the two members he shows, and if we experiment according to Harmatta's instructions (page 2, lines 69-76), we will find that the size of the weld is limited in extent by the contact area of the electrodes, but may be varied under this limit to some extent by a variation of the current employed.

If we confine our attention solely to Harmatta's original application and arrange our work and electrodes as shown in Figure No. 1 of the application where (middle of page 2) "the electrodes are located in the direction of the current directly above the surface or point to be welded", we will find that the size of the weld is limited by the contact area of the smallest electrode and may be varied under this limit by varying the amount of current.

No matter whether we confine our attention entirely to Harmatta's patent or entirely to his original application and make a weld according to either, we will find that the size of the weld is limited by the area of contact of the pointed electrodes and may be varied under this limit by varying the amount of current employed.

It should be noted that in the old art of rivetting the only preparation required for attaching the parts was the providing of holes and the providing of rivets. In the process described by Harmatta's patent absolutely no preparation at all is required. The sheets are simply lapped, as Harmatta shows in his Figure No. 1, and it is

left entirely to the will of the operator where the "electric rivet" is to be placed. This omission of the preparation of the material in the Harmatta process is of great commercial advantage. All that is required in the Harmatta process is to superimpose the sheet metal (page 2, line 40), and place the superposed portions between the electrodes.

The same general characteristic is noted in Harmatta's original application. All that is required is to arrange the parts to be welded so that they (bottom of page 3) "lie upon each other". After so arranging them in this fashion they "are introduced between two electrodes *a* and *b*". The original application shows this lack of preparation in Figure No. 1.

Both Harmatta's patent and the original application indicate by descriptions and drawings that no preparatory modification of the material is required.

In the old art of rivetting every one knows that one rivet may be placed at a time; that is, the operator's attention may be given to each individual rivet. In the case of rivetting machines, the machine may be made very small because the same operation may be repeated over and over again where there are a number of rivets to be set and the machine need not have the capacity to set all the rivets at one time. In Harmatta's patent the same general idea is involved. Each "electric rivet" may be made individually, although there may be hundreds of rivets in the same article being processed. Harmatta tells us (page 2, line 65) "the operation may be repeated upon the work at another point if it is desired to join the pieces together at a number of spots". Harmatta's machine, therefore, is very simple in its construction, as can readily be seen from Figure No. 2 of his patent.

This idea of making one weld at a time is clearly indicated in the original application. He tells us (bottom of page 2) that "Figure No. 1 (of his application) is a view illustrating the welding of two sheets of equal thickness intermittently at certain spots only" and the simplicity of his machine is illustrated by him in his original application in Figure No. 5. This Figure No. 5 of the original application is identical with Figure No. 2 of his patent.

In both the patent and the original application it is clearly indicated that one weld can be made at a time.

If we examine Figure No. 1 of Harmatta's patent bearing in mind, as we have already noted, that the metal heated for welding is entirely surrounded by relatively cold metal, we will find that the weld occurs within the body of the metal, out of range of the operator's view; that is, the operator cannot see the weld he is making.

This same observation is noted regarding Harmatta's original application and is disclosed in the same way by Figure No. 1 of the application.

Both the application and the patent, therefore, indicate that the operator cannot see the weld he is making.

We have already noted that no preparation of the material is required in either the patent or the original application and even though a thick piece is to be welded to a thin piece no alteration of the material is required; that is, the thermal characteristics of plates of different thickness need not be considered. This is due to a large extent to the fact that the weld is made very quickly in both the patent and the application, so that the unequal losses in sheets of different thicknesses, of the heat, need not be considered.

In summing up the above analysis of the Harmatta patent and its original application we find that the two entirely agree. In both:

The object of the process is to produce an "electric rivet" or a small sharply defined place of welding.

The steps in the process are as follows:—

1. Overlapping the sheets.
2. Concentrating the current and pressure at any spot in the overlapped portion.
3. Heating in the line of current and pressure.
4. Welding without modification or mutilation.

The characteristics of the process are as follows:—

1. The parts are heated by their own electrical resistance.
2. The current for welding is concentrated by the electrodes.
3. The pressure for welding is concentrated by the electrodes.
4. The metal softened for welding is surrounded by relatively cold metal.
5. The weld is made very quickly.
6. No modification or formation of extruded metal takes place, or is involved in the welding operation.

7. The parts being welded remain stationary in relation to each other during the welding operation.

8. Electrodes remain cold during the welding operation.

9. The size of the weld is limited by the contact area of the electrodes and may be varied under this limit by varying the amount of current.

10. One weld can be made at a time.

11. No preparatory modification of the work is required.

12. The weld is surrounded and cannot be seen, that is, the operator cannot see the weld he is making.

Q. 4. Please refer to the patents of the prior art to which reference has been made by Mr. Dyer and classify them as to their subject-matter.

A. The following table will indicate the classification of the patents referred to by Mr. Dyer:—

1. *Patents not electric welding.*

a. Arc welding,	Bernados,	363,320.
b. Hot resister,	Coffin,	437,571.
	Bernados (German),	50,909.
c. Soldering,	Thomson,	496,019.
d. Heating only,	Blanchard,	466,266.
	Lemp,	531,197.
	Burton,	647,694.
e. Rivetting,	Thomson,	396,015.

2. *Electric welding.*

a. Butt welding,	Thomson,	347,140.
	Thomson,	347,141.
	Robinson,	574,942.
	Kleinschmidt,	616,436.
b. Seam welding,	Thomson,	444,928.
	Lemp,	553,923.
c. Cross wire welding,	Perry,	670,808.
d. Glut welding,	Parkinson (British),	14,536—1894.

Q. 5. Does the Bernados patent No. 363,320 describe the subject-matter of the Harmatta patent in suit?

A. Bernados patent No. 363,320 does not in any way describe the subject-matter of Harmatta's patent.

Bernados patent No. 363,320 describes a process of arc welding, a process entirely different from electric welding. If we connect one wire from a powerful battery to a sheet of metal and connect the other wire from the battery to a stick of carbon or graphite and place the ends of the stick of carbon in contact with the sheet of metal, no effect is produced. The stick of graphite may heat slightly but the temperature under ordinary conditions would not be too great to hold the carbon stick or rod in the bare hand. The current flows from the battery through the work and the rod, but the only indication that the current is flowing is a slight warming of the carbon rod. If, now, we slightly separate the carbon rod from the work, the electricity continues to flow across this break in the original circuit, with the production of a brilliant light at this broken part of the circuit. This brilliant light is known as an electric arc, or an electric flame. This electric arc or electric flame has many properties in common with an ordinary flame, such as for instance that produced at the ordinary gas jet, or by the many types of gas burners for heating purposes. Like an ordinary flame, it can be blown out and like an ordinary flame it develops a high temperature so that objects coming in contact with this flame may be heated. Bernados has made a practical application of the electric flame or arc to the melting of metals. When we strike or form an arc as we have described, the carbon rod becomes much hotter owing to the high temperature of the flame produced by it. This temperature is so great at the arc that the rod cannot be held in the hand and we therefore must supply a carbon holder, as shown by Bernados in his Figure No. 1. The electrical connections that we have described are illustrated by Bernados in his Figure No. 2. X is the powerful battery the positive pole of which is connected to the electrode or carbon holder which transmits the current to the carbon electrode D. The current is led back from the work shown at  $r\ r'$  to the negative pole of the battery X. The carbon flame produced between the electrode D and the work by separating the electrode from the work is very brilliant, in fact so brilliant that it cannot be viewed by the naked eye; in fact the light is so brilliant that it sunburns the face. The face and eyes therefore must be protected, which we find Bernados does by providing a screen N (Figure No. 3) of highly colored glass (page 2, line 51).

Bernados sets his electrode holder in a stand, which he shows at A in Figure 2, for the convenience of the operator. In Figure No. 3 the stand is mounted on a second stand, shown at M. This second stand M is provided with a number of notches so that the electrode stand may be placed in a number of definite positions. The flame originates, according to Bernados, at the carbon rod, which is made the positive pole of the circuit and terminates at practically the nearest point of the work to the end of the carbon rod. It is only at this point on the work that the work is heated (page 1, lines 87-93). All other portions of the work are heated by the conduction of heat through and by the work. This conduction of heat naturally takes place in all directions from the point being heated, and the point directly in contact with the electric flame therefore is the hottest part of the work. It is therefore practically impossible to overlap two plates or sheets and weld the overlapped portions away from their edges together because the heat of the electric flame only heats the outer surface and as this heat is not only conducted through the work transversely to the place to be welded but is also conducted away laterally. The process, therefore, can only be used to advantage where the points to be attached are exposed to the direct action of the electric flame, such for instance as shown at Figure No. 13. In case this process is to be used for melting the metal together at certain places, as shown in Figure No. 10, it is necessary to first provide the overlapped portions of the work with through holes as Bernados shows in his Figure No. 8, or to provide the holes at least through one of the members as Bernados shows in his Figure No. 9, so that the parts to be attached are in direct contact with the electric flame. If a strict localization of the heating effect is not required, the arc may be played on the overlapped portion for a long period so that the conducted heat will finally melt the metal of both plates, and if the metal is supported so that it will not flow away, like it is doing at Figure No. 20, the parts may be melted together. This process of melting parts together at definite places is more theoretical than practical and has never become a commercial practice. This is because the metal to be operated on, that is, the part between the two overlapped sheets, cannot be brought in contact with the electric flame and is really out of the scope of the invention, which

(page 1, line 18) "contemplates the formation or production of the voltaic arc between the metal to be operated upon and a conductor, which is brought for said purpose into proper proximity to that point on the metal which is to be operated on".

The process and product and the object of the invention are totally different from Harmatta's process. The characteristics of Bernados' patent are different from the characteristics of Harmatta's patent. Bernados' object was not to make an "electric rivet". The patent has nothing whatever to do with welding at all, and as far as I know the whole specification does not contain the word "weld". The steps in the process are totally different from Harmatta. There is no concentrating of the welding current and the welding pressure to any spot in the overlapping portions of the metal. There is no heating in the line of current and pressure. There is no welding without modification. In fact, there is no welding at all, for the process simply deals with melting. As far as the characteristics of the process go, the work is not heated by its own resistance; the current is not concentrated by the electrodes; there is no pressure at all used in the process: the melted metal is not enveloped or enclosed by relatively cold metal; the parts are not attached quickly; there is no absence of modification of the material during the attaching operation for the metal of the work is totally altered in character by melting it; electrodes do not remain cold during the attaching operation; the size of the point of attachment is not governed by the contacting area of the electrodes for it must be remembered that the electrode does not contact at all; and the point of attachment is not hidden from the operator's view.

Bernados' patent shows a process totally different from Harmatta's process; in fact, so different that the two are not easily compared.

Q. 5. Does the Coffin patent No. 437,571 describe the subject-matter of the Harmatta patent in suit?

A. Coffin's patent does not in any way describe Harmatta's process.

This is so obviously different that an analysis seems superfluous. Carbon resistors are made to contact with the parts of the work to be heated (page 1, line 31). It is immaterial to the success of



Coffin's process whether the current flows into the work or not. (See the left-hand rod or part of the work in Coffin's Figures Nos. 4 and 5.)

There is no concentrating of welding current and welding pressure at any spot over the overlapping portions; there is no heating in the line of current and pressure; and there is no welding without modifying, for, according to Coffin, an upset would naturally be produced. (See Coffin's Figure No. 1.) The work is not heated by its own resistance; the current for welding is not concentrated by an electrode; the pressure for welding is not concentrated by the electrode; the softened metal is not surrounded by relatively cold metal; the weld is not made quickly; there is no absence of modification in the welding operation, as a burr is invariably formed; during the welding operation the parts do not remain stationary, but one moves toward the other; the electrodes do not remain cold during the welding process, for, in fact, there are no electrodes in the same sense as in the Harmatta process; the size of the weld is not limited and controlled by the size of the electrodes and the amount of current; where there are a number of welds to be made in joining two parts it is decidedly impractical and I might say impossible to make one of these welds at a time, and the weld is always made in full view of the operator.

The process is very similar to the regular heating in a coal fire, the only difference being that the coal or carbon is electrically heated in Coffin's case, whereas in a coal fire it is chemically heated.

Q. 6. Does the German patent to Bernados No. 50,909 describe the subject-matter of the Harmatta patent in suit?

A. Bernados German patent No. 50,909 does not in any way describe the Harmatta process. This patent describes a process almost identical with that described by Coffin. A hot resistor is brought in contact with the work and it is immaterial to the success of this process whether the current passes across the joint to be attached or not. Figure No. 1 of this patent and Figure No. 6 illustrate the process as carried out when the current does not pass across the joint to be attached. The process pertains more to soldering than it does to welding. The process as applied to soldering is shown in Figures 1, 2, 3 and 6. In Figures 4 and 5 furnaces are provided into which the work to be heated is placed.

The patent differs somewhat from that of Coffin because we are advised that we can make the resistors out of clay, which is practically a non-conductor of electricity, if we give them a slight conductivity by adding to the clay a certain amount of powdered carbon or a certain amount of magnesium or a certain amount of iridium. No matter, however, of what material we make these resistors, the current flowing through them makes them very hot and the work being in contact with these resistors becomes heated by the heat conducted from the resistors to the work. The work is heated in Bernados' case by being in contact with a heated body, the same as the work is heated in a stove by being in contact with the heated fuel.

There is no concentrating of the welding current and pressure at any spot; there is no heating in the line of current and pressure; there is no welding without modification because the outside of the metal must be unduly heated in order to get a welding temperature between the sheets. The work is not heated by its own resistance; a welding current is not concentrated by electrodes; neither is a welding pressure concentrated by electrodes, nor is the metal softened for welding entirely surrounded by relatively cold metal. The weld is not made quickly and there is no absence of modification of the work involved in the welding. In case the work is really welded together there is a movement of one part toward the other part; there are no cold electrodes used in the process and therefore electrodes cannot govern the size of the weld. In case more than one point of attachment is required, it would be practically impossible to make one weld at a time, for the process is a general heating one. When actual welding is done the parts are heated in the electric forge shown at Figures Nos. 4 and 5, and then removed to a suitable hammering or pressing device; the weld, therefore, is always in view of the operator.

The process pertains more to soldering than it does to welding, and throughout the patent the resistors are usually referred to as soldering irons.

Q. 7. Does the Thomson patent No. 496,019 describe the subject-matter of the Harmatta patent in suit?

A. Thomson's patent No. 496,019 has nothing whatever to do with welding and it does not in any way disclose or describe the

subject-matter of Harmatta's patent. The principle of Thomson's process and apparatus are shown in his Figure No. 1, where two soldering irons are placed on opposite sides of the work. These soldering irons are shown at C, C'. The current is passed through these soldering irons for the purpose of heating them, but (page 2, line 16) "it is not necessary in every case to pass the current across the joint from one piece to the other. The current might be passed in the general direction of the line or plane of the joint". The currents used in Thomson's apparatus and machine are very moderate so that the application of this current to the work will not heat it even to the extent of melting a very fusible material, unless this current is first passed through his soldering irons, which are given considerable resistance by making them out of iron (it must be remembered that a soldering iron really consists of copper and that the term "soldering iron" really means a soldering copper), or by making them of copper and facing them with carbon, or by scarring or grooving the contacting surface of the soldering irons (page 2, lines 37-44). Figs. 7 to 15 show Thomson's method of increasing the resistance of his soldering irons. Fig. 18 shows two soldering irons, one placed on each side of the work at C and C'. The contacting surfaces of these soldering irons are roughened as he shows and a train of gears is provided which operates on three screws so that these long soldering irons may be pressed uniformly over a considerable length of the work. Fig. 21 shows a semi-automatic soldering machine where a number of soldering irons are operated in succession so that each may act on a piece of work for a considerable time. As the operation of these soldering irons follow each other one set of soldering irons is always available for placing into the machine a new piece of work. Fig. 21 illustrates that a very moderate pressure is used by Thomson. It also illustrates by the use of the springs *a* that the current is very small. The spring clip in Fig. 22 at C which transmits the current to the upper soldering iron also illustrates the fact that very weak currents are used by Thomson. It is well to note that the current is more concentrated in the cables K, K', the spring clips *a* and the upper contacting brush clip than it is as it passes through the work. The machine is incapable of making a weld, but no doubt would be suitable for soldering, which requires a very much lower temperature and

very much less pressure. In fact, the pressure used in soldering is simply for the purpose of holding the parts in the proper position until the solder sets (page 1, lines 29-32).

The process illustrated in this patent does not differ in any way from the old-fashioned method of sweating the parts together by means of two soldering irons placed on opposite sides of the work, except that the soldering irons are electrically heated.

There is no concentrating of welding current and pressure at any spot. There is no welding without modification or mutilation. There is no welding done at all. The metal of the work is not heated by its own resistance; there is no concentration of a welding current by electrodes, nor is there a concentration of a welding pressure by electrodes; the metal softened and melted for the purpose of attaching the parts together is in contact with metal at the same temperature. The operation is carried out very slowly and requires a long time to wait for the parts to cool before they can be released from the soldering machine, for Thomson tells us this pressure (page 1, line 30) "must be continued and the pieces held rigidly during the cooling or setting of the solder". The melting of the solder and its necessarily accompanying extrusion constitutes a modification during his processing and causes the parts to necessarily move closer together to replace the molten solder. The soldering irons necessarily are heated and special means are provided for causing them to heat. As the process occupies considerable time, the work becomes generally heated and it would be impossible to form separate points of attachment anywhere near each other, the size of the attachment not being subject to any nice or definite limits. The work must be prepared for processing by providing solder or by coating the parts with a suitable flux.

This patent has nothing to do with welding and does not contain the necessary qualifications and characteristics of the welding process.

Q. 8. Does the Blanchard patent No. 466,266 describe the subject-matter of the Harmatta patent in suit?

A. Blanchard's patent No. 466,266 does not in any way describe or disclose the subject-matter of Harmatta's patent. The process is clearly indicated in Blanchard's Figure No. 1, which shows a rivet placed between two electrodes. A current passes from one electrode to the other through the rivet. The object of the patent is

simply to provide a means of heating a rivet. The patent has nothing whatever to do with welding, and an analysis of the patent would be superfluous. It deals with the heating of a rivet, the very article the use of which is avoided by the Harmatta invention. There is only one property in this patent which shows any similarity to Harmatta, and that is the work is heated by its own electrical resistance, but in Blanchard's case the heat is not carried to anywhere near the welding temperature. Otherwise, the patent differs in every conceivable respect.

Q. 9. Does the Lemp patent No. 531,197 describe the subject-matter of the Harmatta patent in suit?

A. Lemp's patent No. 531,197 does not in any way describe the subject-matter of Harmatta's patent.

Lemp provides a process for annealing armor plates. It is more convenient in the manufacture of armor plates to harden the whole plate in its process of manufacture. It is sometimes required, however, that during fabrication holes must be provided in this hardened armor plate, and in order to provide these holes the armor plate must be softened. If the whole plate were softened the plate would be of no use, and it must be softened locally just where the hole is to be placed. Lemp provides a machine for doing this work of locally softening the armor plates which he illustrates in his Figure No. 1. A transformer is provided, as shown at A, with extended terminals B, B. When the transformer is placed on the work it rests, so to speak, on these extended terminals, the weight of the transformer serving to act as a pressure to hold these terminals in contact with the work. In order that this transformer may be handled conveniently an overhead crane is provided, as shown in Figure No. 1. The current passes from one of the terminals to the other through the work. The terminals are rigidly set in relation to each other, so that it would be impossible in Lemp's machine to pinch the work between the terminals, and although Lemp shows a construction in Figure No. 4 where the current is passed through the work, yet no means are indicated of pressing the work between the electrodes, which would be necessary in welding. Lemp's patent does not contain these welding features, because it is not intended for welding, and the word "weld" does not appear in the whole specification. The current

used by Lemp is not sufficient for causing a weld ; neither did Lemp realize that the current when increased to a sufficient amount to weld would remain concentrated as it passed through the work, for he warns us not to increase the current unduly or in a sufficient quantity to cause a weld, for in so doing, the current will distribute itself throughout the work and prevent a local heating. According to Lemp (page 2, lines 89-96), "In order to prevent the current from spreading too much and heating the metal beyond the desired zone of softening care should be taken not to use too heavy or powerful an electric current. This is particularly the case where the attempt is made to pass the current through the metal from one side of a plate to the opposite side." In other words, Lemp was entirely ignorant of the property of the electric current to stay condensed as it passed through the work, the very property on which Harmatta's invention was founded. Lemp tells us (page 3, line 101) "the electrodes or contacts where they engage with the mass of metal are made rather small". He further tells us (page 2, line 100) "each copper contact being about one inch square". This size contact might have been very small according to his ideas on annealing, but such a contact would have been extremely large, considering Harmatta's views on spot welding. In fact, Lemp's small contact would have been too large for Harmatta's spot welding, owing to the fact that sufficient current for Harmatta would not have been available. Even at the present time, no spot welding has been accomplished with electrodes having a bearing surface of one inch square, and bearing directly on the work. The point I wish to bring out in connection with Lemp's patent is, in case someone had conceived the idea of an "electric rivet" and had attempted to use Lemp's machine for the purpose of demonstrating his conception, he would have found the machine entirely worthless for the purpose.

There is no concentration of welding current and pressure at any spot in Lemp's process. In fact, there is no welding at all. From Harmatta's standpoint, there is really no concentration of current by welding electrodes ; nor is there any concentration of a welding pressure. The metal is not brought to a welding temperature, but simply heated for the purpose of annealing. Lemp's process has for its object a modifying or changing of the work from a hard to

a soft condition ; that is, the annealing of the work. In fact, the whole process of Lemp has nothing whatever to do with the "electric rivetting" process of Harmatta.

(Adjourned to Wednesday, November 13, at 10 A. M.)

Boston, November 13, 1918, 10 A. M.

Met pursuant to adjournment.

Present, counsel as before.

Q. 10. Does the Burton patent No. 647,694 describe the subject-matter of the Harmatta patent in suit?

A. The Burton patent No. 647,694 does not in any way describe the subject-matter of the Harmatta patent.

Burton invented a machine for carrying out the regular blacksmith's operation of welding and he tells us (page 1, line 14) "the invention is especially adapted for lapped welding". He then goes on to describe the advantages of the regular blacksmith's method of lapped welding over the blacksmith's method of butt welding. He tells us (page 1, line 16) "the lapped weld is superior to the butt weld. No end pressure is required and consequently there is no upsetting of the metal and no formation of a bulge or projection at the joint, which is afterwards required to be filed or hammered down". These facts were well known to every blacksmith prior to Burton's invention and are simply mentioned by Burton to describe the uses to which his machine could be placed. This is entirely corroborated in the following parts of his specification. He tells us (page 1, line 22) "the object of the invention is to provide a simple, convenient, compact apparatus for the use of a blacksmith or other worker". He then goes on to describe (page 1, line 91) that a blacksmith loses considerable of the heat in the work in transferring his work from the forge to the anvil, but that his invention avoids this loss of heat in carrying the work from the forge to the anvil because he mounts his heating forge directly on the anvil.

Burton illustrates his entire apparatus in detail in his Figure No. 1, where he shows the apparatus in the act of heating the ends of a bent strip or tire. When these ends have become sufficiently heated by his apparatus he shows by the dotted lines how this tire



is transferred to the face of the anvil and hammered in the regular blacksmith's way by a hand hammer.

The apparatus consists of a dynamo 20 which is separately excited by the smaller dynamo 90. The current from the main dynamo passes through the conductor 140 to the switch 130 and then by a hinged arm 150 to a turret or revolving hub 200. This hub is provided with a number of regular blacksmith's tools arranged radially around this hub. Any one of these tools may be selected by the blacksmith and placed in operative position, which is the downward position, or that position occupied by the tool 210. A foot lever is provided to act as a pedal for operating the hinged bar so that the selected tool may be pressed by the foot into contact with the parts to be heated. A tool designed to coact with the turret tool is rigidly mounted on the blacksmith's anvil. This tool is shown at 100 in Figure No. 1. The tool rigidly mounted on the anvil is connected with the other pole of the main dynamo. Burton tells us that the electrode or tool which is rigidly mounted on the anvil is of copper (page 1, line 104) and that the conductor leading from this electrode to the dynamo is of copper (page 2, line 20), and that the hinged bar shown in Figure 1 at 150 is of good conducting material (page 2, line 45), but nowhere does he advise us that the tools mounted on the turret are of copper or of good conducting material.

Burton's machine is purely an electric heater; no welding is intended to be done while the parts of the work are between his heating tools. He tells us (page 2, line 78) "as soon as the piece is heated to the proper temperature which may be ascertained by inspection thereof the operator releases the foot lever and the spring 170 lifts the binged lever 150 and takes the upper electrode out of contact with the work, whereby the circuit is broken". The work now has attained a sufficient temperature so that now "the operator may shove the work forward on the anvil and hammer the joint, or otherwise finish it as desired". Of course before the work has attained this high temperature the operator may not shove his work forward on the anvil, as it would be impossible to weld it. The great thought in Burton's mind seems to be to get the heating apparatus as close to the anvil as possible so that no time will be lost between the heating of the work and the hand hammering of

the work. After telling us that the work has become heated and has reached the stage where the operator may shove his work forward on the anvil, he tells us that "in this way the heating can be quickly and conveniently effected [note that he does not say welding] on the anvil without loss of time and heat and without forming an objectionable bulge in the work".

This bulge referred to by Burton is well understood by every blacksmith. When two bars are heated and placed in abutment it is necessary to apply longitudinal pressure to the parts, as otherwise the weld cannot be subjected to pressure, which is of course necessary in a true welding operation. This pressure of course tends to bulge the work at the joint. If, however, we scarfe or chamfer off the edges of the bars and lap the joint, this end or longitudinal pressure will be of no avail as by it no pressure can be exerted at the joint. The lapped joint requires a transverse pressure. This transverse pressure tends to make the joint thinner instead of bulging it, as is the case with the longitudinal pressure. In order to prevent this thinning the blacksmith laps his joint in such a way that the joint is thicker when starting the pressure on it so that on completing the pressure or hammering the transverse pressure, which is usually applied with a hammer, thins down this thick joint to the original section of the material.

The formation of this lapped joint was understood by Burton, as it will be noted in his Figures Nos. 1 and 2 and also Fig. 11, that he does not allow the scarfed portions of the work to contact, but heats them in a disengaged position so that when the work is transferred from the heating device to the anvil he may overlap the pieces so that they are thicker at the joint, so that when they are hammered on the anvil as shown by the dotted lines in his Figure No. 1, the joint will be thinned down to the original section of the material on which he is operating.

Burton's machine is simply an electric heating device in which the work is generally heated at or near the place to be welded. In order to do this, he passes the current across the two ends of the work in practically a transverse direction to the joint. He tells us (page 2, line 73) "the current passes through the work in transverse direction across the overlapping ends of the parts to be heated" (note that he does not say the parts to be welded). This

he illustrates in many of his figures (Fig. No. 1, Fig. No. 2, Fig. No. 11, Fig. No. 12). It is evident from these figures that although he passes the current "through the work in transverse direction across the overlapping ends of the parts to be heated" he does not pass the current across the joint.

Even when a butt weld is to be made, as the seam of a tube, the parts to be welded are not placed in contact in his heating device. It should also be noted that the whole tube would become heated and not just the seam which is to be welded, in fact, the tube would be heated just the same as if it had been placed in the ordinary blacksmith's forge. Different shapes of work require, according to Burton, different shaped tools. Some of the uses of these tools are indicated in his Figures Nos. 3 to 13. Figures Nos. 3 and 4 show his idea of a tool for countersinking screw holes (page 1, line 35). Figure No. 7 shows the tools used for lapped welding two sections of pipe of different sizes.

It should be noted that Burton has failed to grasp the fundamental principles of electric welding; for instance, Prof. Thomson tells us in his original patent on the subject (patent No. 347,140, page 3, line 10) that the resistance of the work should be a large fraction of the total resistance of the welding circuit. Burton's Figure No. 1 illustrates that this is not the case. Observe the long conductors reaching from the dynamo to his heating device; observe the many joints in the circuit; observe the slender arm connecting his various tools with the revolving hub or turret; and observe how he spreads out the current as it passes through the work. It would be impossible in this construction to have the work a large fraction of the total resistance. Burton's Figure No. 1 shows that the work constitutes but a small fraction of the total resistance of the welding circuit.

Burton's patent does not even disclose "electric welding", let alone Harmatta's improvement in "electric welding".

Burton does not show any means of concentrating a welding current and welding pressure at any spot over the overlapping portions of his work; he does not show a method of electric welding without modifying or scarring the material. The current is not concentrated by means of electrodes; the welding pressure is not concentrated by means of the electrodes; the metal softened for

welding is not entirely confined by relatively cold metal, and from an electric welding standpoint Burton does his welding very slowly. Burton more or less modifies or mutilates his work (compare Burton's blacksmith's weld with the Harmatta spot weld). The parts being welded do not remain stationary throughout the welding operation, for not only is the work moved from the heating device to the anvil, but the hammer blows force one part of the work bodily toward the other part. The size of Burton's weld is not limited by the contacting areas of the electrodes, nor can it be varied by varying the amount of current. In case more than one weld is desired between the overlapping parts Burton could not make one weld at a time. It should be noted that when Burton makes lapped welds the work is subjected to a preparatory modification, that is, the work is scarfed as shown in Figures No. 1 and No. 2. Burton's weld is not hidden from view, but is made within full view of the operator in exactly the same manner as is employed by all blacksmiths on an anvil. The apparatus is allowed to heat the work gradually until it attains the proper temperature and (page 2, line 78) "as soon as the piece is heated to the proper temperature, which may be ascertained by inspection thereof, the operator releases the foot lever and the spring 170 lifts the hinged lever 150", etc.

Burton's object is not to form a weld which will take the place of a rivet, for if this was the case Burton would not show, in his Figure No. 13, how his apparatus can be applied to riveting, neither would he show the arrangement of the work like it is in his other figures, for in no case illustrated by these figures could a riveted construction be used with any degree of commercial satisfaction.

Burton's machine and methods simply illustrate or show a method of substituting a blacksmith's forge by an electric heater, and do not in the slightest way disclose or suggest Harmatta's method of producing "electric rivets".

Q. 11. Does Thomson's patent No. 396,015 describe the subject-matter of the Harmatta patent in suit?

A. Thomson's patent No. 396,015 does not in any way disclose the subject-matter of Harmatta's process. This is practically evident on the face of the Thomson patent, for why should Thomson

patent a method of rivetting if a method to avoid rivetting as shown by Harmatta was in his mind?

Thomson tells us that his invention (page 1, line 8) "consists essentially in a method of riveting by placing the rivet or rivet blank in position in the socket or hole designed to receive it, passing through said rivet an electric current of sufficient volume to heat the same to the requisite temperature and then setting the rivet in its position by endwise pressure or other means employed in the ordinary riveting operations". In other words, Thomson's method of electric rivetting is the same as the ordinary method of electric rivetting with the exception that the rivet is heated after it has been passed through the work which it is to attach together.

Thomson's process and apparatus are shown in their simplest form in his Figure No. 1. After providing a through hole in the parts to be attached, the rivet blank is placed through these parts and placed between two rivet-setting tools G and E (Figure No. 1). These rivet-setting tools are made the terminals of an electric circuit by being in metallic contact with the conductors C and C', which constitute the arms of the machine and which in turn are respectively connected with D and D', the cables which connect to the source of current. The current flows from one setting tool to the other through the rivet blank to be heated. This heating of the rivet blank of course causes it to soften so that it may be easily set by exerting pressure between the setting tools by means of the hand wheel W operating on a screw. This method carried out as described by Thomson produces exactly the same results, but in a more convenient way, as if the rivet had been heated in a regular blacksmith's forge and inserted through the sheets in this heated condition and set by the setting tools shown in Figure No. 1.

The method, however, may be elaborated on so as to produce an effect which would not be possible by heating the rivet before it is placed in the work. According to this elaboration (page 1, line 25), "the current may be allowed to pass for a longer period and until the central portion of the rivet, as well as the metal near thereto, is raised to a welding temperature, when the application of pressure expanding the rivet in its seat will weld the same to the metal surrounding it and the application of the pressure to the pieces to be riveted will weld them together around the rivet";

(page 2, line 28) this "valuable effect not possible in other processes may be obtained by a method of riveting by continuing the heating of the rivet blank placed through the hole for some moments longer than it is necessary to raise it to a softening temperature. By conduction the heat is carried to the portions of the plate surrounding the rivet, raising such portions to a welding temperature, and when the rivet is pushed firmly into the hole a partial welding of the rivet to the sides of the hole is effected, thus forming practically solid metal for a portion of the distance from D to D' " (Figure No. 6).

These effects of welding the rivet to the sides of the hole are effected by the machine illustrated in Thomson's Figure No. 1.

It will be noted that in Figure No. 1, prior to the application of the pressure which upsets the rivet, there is nothing to hold the plates in overlapping contact and in case the work is of a springy nature there is danger of the rivet being upset between the sheets instead of on the outside of the sheets. Thomson therefore provides pressure plates for holding this work together prior to the time that the rivet is upset. One form of his device using pressure plates he illustrates in Figure No. 9. As these pressure plates are more satisfactorily made out of metal than any other material and as a satisfactory construction makes these pressure plates contact with the parts of the machine which convey the current to the setting tools they naturally will conduct the current directly into the work. In the construction shown in Figure No. 9 this short circuiting of the rivet by the pressure plates is avoided by inserting insulation  $m, m'$  between the pressure plates and the work. Thomson tells us that (page 2, line 68) "By the use of this form of apparatus a heating electric current might be passed through the metal plates themselves at parts *around* the rivet" by removing the mica pieces  $m, m'$  from between the pressure plates and the work. "Such current would *assist* in raising the portion of the plates immediately around the rivet to a welding temperature." According to Thomson's description, it would be supposed that the pressure plates were of a circular shape so as to press the plates together all the way around the rivet. This view is corroborated by Thomson's description where he tells us (page 2, line 61) that these pressure plates are forced hard against the work. If the mica  $m, m'$

is removed from between the pressure plates and the work and the pressure plates K be screwed up hard against the work, this hard pressure would bend the plates, if we consider Figure No. 9 a working drawing, as the bi-forked members of the pressure plates would not come opposite each other. Figure No. 9 therefore is more of a diagram than a working drawing and practically illustrates the pressure plates in sections, in the same way that Figure No. 10 illustrates the pressure plate K<sup>2</sup> in section. Referring again to Figure No. 9, the pressure plate K<sup>1</sup> is made integral with the arms of the machine. The pressure plate K is a heavy clamping piece which passes through the left-hand arm of the machine and on which the screw S<sup>1</sup> is turned, so that it may be made to approach or recede from the work by rotating it. According to Thomson (page 2, line 57) the piece K in Fig. 9 is not a composite body, but a single clamping piece provided with a screw which is cut on the piece K itself.

It should be noted that the pressure plates K and K<sup>1</sup> bear on the work at some distance from the rivet and not "immediately surrounding the rivet".

Thomson tells us that (page 1, line 25) the rivet may be welded to the sheet and that the sheets themselves may be welded together immediately around the rivet. This he illustrates with Figures Nos. 6 and 7. It should be noted that the welding together of the two plates occurs immediately around the rivet and that the heat required for raising these plates to a welding temperature is obtained by conduction from the heated rivet blanks. When the pressure plates are used the heat generated between these pressure plates which are remotely located from the rivet generally heats the plates at a remote circle around the rivet and prevents to some extent the escape of this heat conducted from the rivet. As the heat being conducted from the rivet is to some extent prevented from escaping by this circle of heat remotely located from the rivet it is easily seen that the current flowing between the pressure plates (page 2, line 73) "would assist in raising the portion of the plates *immediately surrounding the rivet* to the welding temperature".

Thomson illustrates in his Figures Nos. 6 and 7 where the welding between the two plates occurs, which is *immediately around the rivet*, but when we examine Figures Nos. 9 and 10 we find that the



pressure plates do not bear on the work *immediately around the rivet*; therefore the weld between the two plates does not occur between the pressure plates, or if we consider the pressure plates as electrodes the weld does not occur between these two electrodes.

Figure No. 10 illustrates a modified form of pressure plate which is made to bear on the work by means of the spring S. This pressure plate is tubular in shape and is shown in the drawing in cross-section. Thomson tells us that pressure is applied to this pressure plate  $K^2$  by means of the spring S S. If we examine the drawing with the idea that the top pressure device is a distinct and separate piece from the lower pressure device, we find that the spring does not make contact with the part of the pressure device marked  $K^2$ , and it therefore would not bear on the work with any sure pressure. It is therefore plainly evident that the pressure device  $K^2$  is tubular in shape and shown in cross-section. In fact, Thomson tells us that the clamping devices on each side of the work are heavy single pieces.

These clamping devices have no tendency to concentrate the current and in fact the current is more concentrated if it was allowed to pass through the rivet blank without the use of or by insulating the pressure plates.

Thomson's idea when welding in connection with his riveting is to supply the entire welding heat in the sheets by conduction and not generate this heat in the sheets themselves by their own resistance at the place where they are welded. Read what Thomson says (page 2, line 33): "By conduction the heat is carried to the portions of the plates surrounding the rivet, raising such portions to a welding temperature."

When considering the welding phase of Thomson's patent the rivet acts as a resistor for generating the heat used in welding the plates together. The process, therefore, is not an electric welding one and has nothing to do with "electric welding". There is no concentrating of welding current and a welding pressure at any spot over the overlapped portions; the welding must be confined entirely to immediately around the rivet. The plates heated for welding are not heated in the line of current and pressure. There is no welding without modifying the material, for his welding is always accompanied by the upsetting of a rivet. The parts of the

plates which are welded are not heated by their own resistance at that point. The current for welding is not concentrated by means of electrodes and the pressure for welding is not concentrated by means of electrodes. The metal of the plates which are softened for welding is not surrounded by relatively cold metal, but lies in contact with the highly heated rivet. When welding occurs it occurs slowly; that is, the current is allowed to pass for a longer period than when the rivet is simply headed without the accompanying welding operation (page 1, lines 25, 26). The work is always modified when a weld occurs; that is, the rivet must be upset. The size of the weld is not governed by the contacting area of the electrodes and the size of the weld cannot be varied by varying the amount of current. One weld cannot be made at a time, for it is always necessary that the rivet weld to the sheets at the same time that the sheets themselves are welded together. A preparatory modification of the work is always necessary in that holes must be provided and rivet blanks supplied.

The process has nothing whatever to do with Harmatta's idea of substituting a rivet by an electric weld, which is evident on the face of Thomson's patent, which is a method of electric riveting.

Q. 12. Does the Thomson patent No. 347,140 describe the subject-matter of the Harmatta patent in suit?

A. Thomson's patent No. 347,140 does not describe the subject-matter of Harmatta's patent.

This is the fundamental patent of the art of electric welding in which the term "electric welding" is coined, to describe the process and its characteristics. If we grasp a bar of metal in each hand near the ends of the rods and then press the two ends together, that is, abut them, we follow out the mechanical principle of Thomson's butt welding machine. In Thomson's machine each rod is gripped near its end by a clamp or a vise and the rods are kept in alignment in abutting position. The clamps or vises are the terminals of an electric circuit, so that the current passes from one clamp to the other through the projecting ends of the work to be welded. This is shown in Thomson's Figure No. 1, where K and K' are the clamps or vises mechanically mounted on the arms L and L' and the two clamps are forced together by means of the spring S. The work in this figure consists of rods or wires to be

welded together and are shown at W, W'. The work is allowed to extend through the clamps forming slight projections as shown at J. The current passes from the conductor C, which is attached to a source of current, through the arm L, to the clamp K' (which in the drawing is shown removed), through the abutting portions of the work to the clamp K, thence through the arm L and conductors C, back to the source of current. It will be noted that nothing is applied to the work except electricity and pressure and all the heat used for welding is developed directly in the work itself due to the passage of the current through the work. As the development of heat by electricity depends on the resistance of the conductor through which it is flowing, Thomson makes the resistance of the work a large fraction of the total resistance of the welding circuit (page 3, line 11). The passage of the current through the work causes the work to heat and when it becomes softened the two clamps holding the work are forced together, so that one part of the work moves bodily toward the other part of the work (page 2, line 5). This approach of one part of the work to the other part causes an upset or burr (page 2, lines 24, 25). Thomson tells us that "the burr can easily be filed off or ground off". According to Thomson (page 2, line 115) the process does not act quickly enough to disregard the thermal characteristics of the two parts being united and in case we are to weld a large rod to a small rod the large rod must be machined down where it projects from the clamp to the same area as the small rod.

Thomson's process does not contemplate arranging the work so that it can be rivetted, as all the joints he has in mind are butt joints and incapable of being rivetted with any degree of commercial satisfaction. There is therefore no thought of an electric rivet or a weld to take the place of an electric rivet in Thomson's mind. It is the entire contacting surface between the parts of the work which are welded.

The object of Thomson's process is therefore entirely different from the object of the Harmatta process. Thomson does not propose a weld to replace a rivet because he is dealing with conditions under which there cannot be rivetting. He does not overlap the parts to be welded, but butts them. He does not concentrate a welding current and a welding pressure at any spot in overlapped

portions of his work. He does not weld without modification as his process invariably produces a burr or upset. The current for welding is not concentrated by his vise-like clamp electrodes. He does not concentrate the welding pressure by his electrodes. The metal softened for welding is not surrounded by relatively cold metal, and according to Harmatta's idea of welding the weld is made very slowly so that the thermal characteristics of the two parts being welded must be considered, and if one part is large and the other small, the part of large section must be reduced where it abuts the piece of small section. The work is modified during the welding process by the formation of the burr or upset. The work does not remain stationary during the process but one part bodily approaches the other part. The size of the weld is not limited by the contacting area of his vise electrodes and it would be impossible according to Thomson to make small single welds one at a time between the surfaces in contact. During the welding operation the weld is within full view of the operator and is not hidden by being entirely surrounded with cold metal.

Although Thomson's patent is a true case of electric welding, it in no wise discloses the subject-matter of Harmatta's patent.

Q. 13. Does the Thomson patent No. 347,141 describe the subject-matter of the Harmatta patent in suit?

A. This patent does not in any way disclose the subject-matter of the Harmatta patent and as far as my criticism goes is entirely covered by what I have said of Thomson's patent No. 347,140. And what I have said about Thomson's patent No. 347,140 is equally true of Thomson's patent No. 347,141.

Q. 14. Does the Robinson patent No. 574,942 describe the subject-matter of the Harmatta patent in suit?

A. Robinson's patent does not in any way describe the subject-matter of Harmatta's process.

Robinson's patent does not describe really any process or any machine, but does describe a special form of rail joint. Each rail is provided with an extending fish plate or connecting plate and these fish plates are placed on opposite sides of the rails to be united. The two rails are then placed together in dovetail fashion and the joint is finally completed by binding the whole assembly together with bolts. The members to be united to the rails are provided

with projections shown at *d* in Figures Nos. 1 and 2 and at *i* in Figures Nos. 11, 12, 13, 14, 15, 16, 18 and 20.

The fish plates are assembled against the rails but separated from the rails by the projecting portions. According to Robinson (page 2, line 24), when the current is turned on these projecting portions and the part of the rail where they contact are brought to a welding heat and (page 2, line 32) "when the contact points and the corresponding points of the bottom of the rail have reached a welding heat the plate B and the rail A are rigidly clamped together to produce the weld".

Robinson does not describe how this is to be accomplished, but his proposition is to weld the ends of the projections butt on to the flat sides of the rail. His process, therefore, is a butt welding one in which he takes no account of the thermal characteristics of the two parts being welded, like Thomson does. It is therefore a question whether his construction would be commercially operative. The process is not one designed to replace a rivet by an "electric weld" for his welds are placed at the extreme edge of the fish plate where a rivet would never be used. (See Figure 20.) The welding is not unaccompanied by a modification, for the projecting parts flow or are upset, and his work is especially designed to provide room for this upset (page 1, lines 66-90). According to Robinson, the current for welding is not concentrated by the electrodes. Neither is the pressure used for welding concentrated by the electrodes. The metal softened for welding is not entirely surrounded by relatively cold metal. (See Figure 20.) There is no lack of modification involved in the welding, for Robinson's weld is always accompanied by an extrusion or flowing of the metal (page 1, lines 66-90). The parts being welded together do not remain stationary with relation to each other during the welding operation, as the projection heats and becomes softened and allows the members to approach nearer to the rails. The size of Robinson's weld is not limited by the contact area of the electrodes; neither can the size of the weld be varied by varying the amount of current. As Robinson is dealing with heavy plates all his welds which unite these plates to the rails must be made at the same time (page 2, line 32). According to Robinson, his work is subject to a preparatory modification by forming projections on one of the parts to be welded;

that is, he forms projections on the fish plates. Owing to the fact that the projections separate the two main bodies being welded the weld can be made in the view of the operator, by looking end-wise at his work, as shown in Figure No. 20. I can see no suggestion of the subject-matter of the Harmatta process in Robinson's patent.

*Q. 15.* Does the Kleinschmidt patent No. 616,436 describe the subject-matter of the Harmatta patent in suit?

*A.* Kleinschmidt's patent No. 616,436 does not describe in any way the subject-matter of Harmatta's patent.

Kleinschmidt describes an apparatus and a process of welding splice-bars to rails for the construction of what is known as continuous track welding. These splice-bars are shown in Figure No. 2 and are provided with projections *b, b*. Two of these splice-bars are arranged one on each side of the rail with the projections or bosses in alignment, as shown at B in Figure No. 1. These splice-bars are pressed firmly against the rail by push-blocks which are made the terminals of a transformer, shown at C in Figure No. 1. The current therefore passes from one push-block to the other through the assembled work. The operation is really a case of butt welding two rods together with a web of metal interposed between the abutting ends of the rods, Kleinschmidt's bosses or projections constituting the rods. Like in butt welding, the current is passed longitudinally through the projecting bosses, and like in butt welding there is an upsetting action (page 1, line 84).

According to Kleinschmidt, there is no concentrating of a welding current and a welding pressure at any spot over the lapped portions, as this concentration of current pressure is pre-located by the position of Kleinschmidt's projections or bosses. There is no welding without modification, as the process is always accompanied by an upsetting action (page 1, line 34). The current is not concentrated by the electrodes, neither is the pressure used for welding concentrated by the electrodes. The metal softened for welding is not entirely enclosed by relatively cold metal. The process entails considerable time (page 1, line 92). There is a modification of the work involved in the welding process; that is, the bosses or projections are upset and reduced in height, and owing to this upsetting action the splice-bars move bodily toward the rails during

the welding operation. The size of the weld is not limited by the contact area of the electrode; neither can the size of the weld be varied under this limit by the amount of current. According to Kleinschmidt, one weld cannot be made at a time, as there is a weld on each side of the rail, constituting two welds, both of which must be made at the same time. There is a preparatory modification of the work required; that is, the splice-bars must be provided with projections. If the operator desires to watch the progress of his welding he may look endwise at his work, obtaining the view as shown in Figure No. 1.

Kleinschmidt's idea and object was not to provide an electric weld to take the place of a rivet, but to provide a means of rigidly holding two rails together which depended on the contracting and expanding of the splice-bar due to the heating effect, and has nothing to do with Harmatta's idea of an electric rivet and his means for obtaining the same.

Q. 16. Does the Thomson patent No. 444,928 describe the subject-matter of Harmatta's patent in suit?

A. Thomson's patent No. 444,928 does not describe in any way the subject-matter of the Harmatta patent.

This patent describes a process which is known to the trade as "lapped seam edge welding", and the whole principle of the invention is disclosed in Thomson's Figure No. 1. Two rolls are provided R, R', and located in suitable housings F, F' and by means of these housings kept in alignment by the base D. The hand screw S enables the two rolls to be pressed together. The work, consisting of two plates or sheets which are to be continuously attached along their edges, are lapped along the said edges and introduced between the rolls as Thomson shows in his Figure No. 1. As the work is fed between the rolls the current passes from one roll to the other through the overlapped edges of the work. This current heats the work across the overlapped portions and the rolls which are firmly pressed together supply the necessary pressure. The weld once started at the beginning of the sheets progresses along the edges of the sheets until the other end of the sheets is reached.

According to Thomson, the work must be properly arranged between these rolls (page 1, lines 33, 34) and a practical demon-



stration of the process clearly demonstrates this, for if the sheets are lapped too much insufficient heat will be produced to form a weld, and if they are not lapped enough the metal will be too highly heated. The process requires very expert care and is therefore limited in its commercial application, as it is necessary to keep the edges just slightly overlapped in a uniform manner the whole length of the seam, which is almost impossible in commercial work. Thomson refers to this in his specification (page 1, line 84). "In Figure No. 1", says Thomson (page 1, line 78), "I have illustrated the application of my invention to the welding of the edges of two plates M, M' together, the plates being shown in end view as in position between the rolls *ready* to be fed between them in the longitudinal direction of such plates." In other words, these plates are ready to be welded but are not yet welded, the current not having been yet turned on, as otherwise the plates would have been shown as forced into each other. This is also true of Figures Nos. 2 and 3. When Thomson's machine is actually welding the metal is actually softened and the screw is given a few turns so that the thickness of the seam is practically the thickness of one plate only and not the two plates as shown in his figures (page 1, lines 88-94). In Figure No. 1 it will be noted that the lapped portions of the plates are very slight (page 1, line 84) and well within the width of the rolls. The current, therefore, flowing between the rolls must concentrate itself to pass across this small overlap. No matter how much larger the rolls are made across their faces and no matter how much smaller the faces of the rolls are made, provided that they extend beyond the extreme edges of the work, this concentration of the welding current will not be effected. This is likewise true of the welding pressure; it is this lapped portion where one part of the metal is superimposed on the other part of the metal, and it is the superimposed portion which reacts against the pressure exerted by the rolls. No matter how large or small the faces of the rolls are made, provided, however, they are not made smaller than the overlap, this pressure used in the welding is concentrated by the overlap and not by the face of the rolls. This process of Thomson's is one of motion, for a continuous welding process; Harmatta's process is one of rest. Thomson keeps a heated spot continuously between his revolving elec-

trodes and feeds the heated spot along the seam to be welded. Harmatta's heated spot lasts but a moment.

According to Thomson there is no concentration of the welding current at any spot over the overlapped portions, as the entire lapping portions become heated. There is no welding without modification, as one part is forced into the other part, resulting in a burr or upset as it comes under the rolls. According to Thomson, the current for welding is not concentrated by the electrodes. The pressure for welding is not concentrated by the electrodes. The metal softened for welding is not entirely enclosed by relatively cold metals, for as the process is a progressive one that point which is being welded is in direct contact with the hot portion which has just been welded, and then too the edges of the work are not in contact with cold metal. The weld considered as a whole is made slowly as it requires considerable time to complete this long weld; the heat located between the rolls is maintained for a long period or until the seam is finished. There is a modification of the work involved in the welding; that is, one part is pressed into the other part so that the finished seam, although made up of the metal of the two plates, is reduced in thickness to very nearly the thickness of but a single plate. The parts therefore move toward each other in the welding operation and therefore cannot be considered relatively stationary. The size of the weld produced in this Thomson patent is not governed by the contact area of an electrode; neither can the size of the weld be varied by varying the amount of current. We can hardly say that one weld is made at a time, as in Harmatta's case. Harmatta's weld we might say is made instantaneously, whereas Thomson's is made progressively. Thomson's weld occurs at the extreme edges of the plates and can be easily viewed by the operator while he is making it.

Although this patent shows a true electric welding process, it does not in any way disclose Harmatta's idea of an "electric rivet" or the subject-matter of Harmatta's patent.

(Adjourned to Thursday, November 14, at 9.30 A. M.)

BOSTON, MASS., November 14, 1918, 9.30 A. M.

Met pursuant to adjournment.

Present, counsel as before.

Q. 17. Does the Lemp patent No. 553,923 describe the subject-matter of the Harmatta patent in suit?

A. Lemp's patent No. 553,923 does not disclose the subject-matter of Harmatta's patent.

Lemp tells us (page 1, line 13) that "the object of my invention is to provide a more thorough and uniform heating of the work in the operation", and that the (page 1, line 22) "invention is especially applicable to a metal forming operation consisting in the forming of long joints between strips, plates, bars or rods, such as boiler plates or other articles". He further tells us that his invention is especially adapted (page 1, line 27) to welding, soldering, cementing or similar operations and also to simple shaping, rolling or forming of a metal rod, bar or strip which is fed continuously between the forming pressure devices. He tells us (page 1, line 15) that "the invention consists in applying to the metal heating currents of different frequency during the manipulation thereof".

According, therefore, to Lemp's own description, his invention is in the category of electric heating for welding, rather than simple electric welding.

The simplest form of Lemp's invention, that is, the form in which it is most easily understood from an electrical standpoint, is illustrated in Lemp's Figure No. 4 where A and A' represent two transformers placed on opposite sides of the strips of metal to be operated on. These transformers have secondaries B and B' which terminate in roller electrodes D, D', D<sup>2</sup> and D<sup>2</sup> which bear on the strips. The polarity of these secondaries is so arranged that currents flow longitudinally through the strips as indicated by the arrows; that is, a separate current is passed through each strip. The object of this longitudinal current is to heat the strips for a subsequent operation. After the strips have become heated by being run between the terminals of these transformers, they pass between the terminals of a second set of transformers, shown at A<sup>2</sup> and A<sup>2</sup>. This second set of transformers is mechanically arranged in a similar manner to the first, but the polarity of the secondary

terminals of these transformers are so connected that the currents pass transversely through the heated strips. The terminals  $D^1$  and  $D^2$  of the second set of transformers further heat the work. The last set of terminals  $D^4$  and  $D^5$  applies the welding pressure to the preheated work.

After securing an apparatus to produce the effect he desires he proceeds to simplify the mechanical construction of the machine without altering its electrical principle. This he does by combining the terminals  $D^1$  and  $D^2$  of his first set of transformers, A and  $A^1$ , with the terminals  $D^4$  and  $D^5$  of the second set of transformers,  $A^2$  and  $A^3$ , and by replacing the rolls which are only used for transmitting the current to the work by electrical brushes. This simplification of the machine Lemp illustrates in his Figure No. 3. Lemp further develops his idea to produce a still simpler machine which he illustrates in Figure No. 5 where he actually combines the two sets of transformers to give the same result as in his previous machine. This he does by providing each of the transformers with two primary windings, each set of primaries being connected with a different source of alternating current. These two sources of alternating current differ in frequency (page 1, lines 16-18). The use of these two alternating currents which differ in frequency results in the formation of two currents in the work, one current acting for the first instant and the second current acting for the second instant, following each other continuously in rapid succession. The result of this is that one current flows longitudinally through the work as illustrated by the arrows in Figure No. 5 and the other current flows transversely through the work, for instance, between D and  $D^2$  and between  $D^1$  and  $D^3$ . In the most highly developed form of Lemp's invention it will be noted that the pressure devices shown at  $D^3$  and  $D^6$  are not made the terminals of an electric circuit and are entirely separate from Lemp's electric heating machine, which emphasizes more than ever the fact that the object of his invention (page 1, line 13) "is to provide a more thorough and uniform heating of the work".

Lemp's idea is to make each part of the work hot throughout its whole body and his figures illustrate narrow strips, one laid on top of the other, that is, side by side and not lapped just on their edges, and to provide rolls and brushes to extend across the full width of

the strips. This is clearly indicated by Lemp where he describes how his currents are to be regulated when welding strips together of different widths and thicknesses. Lemp tells us (page 3, line 28) "in Figure No. 5 [which shows Lemp's most refined design] R and R' are such regulating devices so that if it is desired to weld stock of a large section, a heavier longitudinal current may be used without increasing the transverse current. Thus, for instance, the longitudinal current would be increased when the thickness of the piece to be welded was increased, but where the width was not. This would make a heavier path for the longitudinal current, but the section of the stock through which the transverse current flows would be no greater. The length of the path through the work for the transverse current might be slightly increased but would be almost nothing as compared with the increased section for the longitudinal current; or, if the increase of the thickness were attended by an increase of the width, then the transverse current would be increased in the proper ratio. Again, if the width of the stock was increased and the thickness correspondingly decreased in such ratio as to maintain the same area of cross section transversely through the bar or bars to be heated the longitudinal current would remain the same, while the transverse current would need to be larger, as the cross sectional area of the path would now be larger."

These remarks by Lemp clearly disclose that the path of the current is entirely governed by the size of the work and that Lemp has no idea whatever of governing the size of the path through the work by shaping his electrodes for that purpose, as is done by Harmatta. When Lemp's work is wide he provides wide rolls so that the rolls will extend entirely across the width of the work. This he must do in order to provide the currents which he says he does provide in the part of the specification which we have just quoted.

In order to illustrate the principles of his machine and show its advantages, Lemp illustrates in Figures No. 1 and No. 2 an impractical machine or one which possesses disadvantages. This machine illustrated in Figures No. 1 and No. 2 is practically one-half of Lemp's complete machine, or that part illustrated at A and A' in Lemp's Figure No. 4. Lemp tells us that in this crude machine of Figure No. 1 two independent currents are passed

through the work, one current through each of the strips, in the direction shown by the arrow X in Figure No. 1, that is, one current flows from D to D<sup>1</sup> and the other current flows from D<sup>2</sup> to D<sup>3</sup>. According to Lemp, he is not sure in these old machines whether the pressure devices shown at D<sup>1</sup> and D<sup>3</sup> are used as terminals or not (page 1, line 96, to page 2, line 1). It is also well worth noting that in describing this defective machine Lemp tells us that two strips are indicated between the rolls at M, whereas the draftsman has not illustrated this work as strips but as wide plates. Figure No. 2 therefore does not agree with Lemp's description.

In all of Lemp's devices, even the devices of Figures Nos. 1 and 2, the work is pre-heated before it is passed through the pressure devices where the weld is actually made, and according to Lemp it is not necessary that these pressure devices are the terminals of an electric circuit, or, according to Lemp, the member which feeds the electricity is not thus at the same time the tool which provides the necessary welding pressure.

Lemp's idea was not to form an electric rivet or a weld perfectly answering the purpose of a rivet. Lemp showed no method of concentrating a welding current and a welding pressure at any spot in the lapped portions of two sheets. Lemp made both strips hot throughout their entire sections and therefore when they were acted on by the welding pressure there was a modification or change in shape of the work, accompanied by a certain amount of extrusion. The current for welding was not concentrated by Lemp's electrodes; neither was the pressure used for welding concentrated by the electrodes. The metal which Lemp pre-heated and softened for welding under his pressure devices was not entirely surrounded by relatively cold metal. Lemp's weld was not made quickly, as the operation required pre-heating at one station and transferring to another station to be upset and welded, involving considerable time. The welding operation deformed or altered the shape of the section of his strips and therefore modified them, especially in their cross-sections. This pressure exerted by Lemp on his heated strips forced one strip toward the other strip so that in the welding operation one part of his work was forced bodily toward the other part of the work. The size of Lemp's weld was not limited by the size of his electrodes; neither could the size of the weld be varied

under this limit by varying the amount of current. It would have been impossible according to Lemp's invention to make a number of separate welds in the plane surfaces of his work; the process is limited to one elongated weld. Lemp's weld and the heating for Lemp's weld was within full view of the operator. Lamp's weld is one of motion or a progressive weld in which the heated place is maintained between the terminals of his welding machine as the work progresses through the machine. Lemp's process is one of motion; Harmatta's process is one of rest.

Q. 18. Does the Perry patent No. 670,808 describe the subject-matter of the Harmatta patent in suit?

A. Perry's patent No. 670,808 does not in any way describe the subject-matter of Harmatta's patent.

Perry's method of electric welding is carried out by the apparatus shown in his figures. The apparatus consists of two push-blocks *f* and *g* which are made the terminals of an electric circuit. The work is placed between these push-blocks and when the circuit is closed the current passes from one push-block to the other through the work. These push-blocks are (page 1, line 75) "relatively of large volume or area compared to the contacting metal to be welded", so that Perry must select special shapes of work so that the work itself will concentrate the current and pressure. Perry tells us (page 1, line 83): "When the said parts to be welded are brought into contact their contacting faces are of relatively small area." The work suitable for Perry's process is crossing wires, as shown in his Figures Nos. 1, 4, 5 and 7, or contacting spheres which he shows in his Figures Nos. 6 and 7. When this form of work is placed between Perry's push-block electrodes and the current turned on the metal immediately is heated, softened and pushed together with an accompanying extrusion of metal. When the parts are relatively small this extrusion is in the gaseous form or in the form of volatilized metal (page 1, line 100), but where the work is of any material size it takes the form of the characteristic filet or burr (page 2, line 9). Perry's new result was what is now called cross-wire welding. Perry did not deal with work which could be rivetted together and his invention does not pertain in any way to a weld which will perfectly answer the purpose of a rivet. Perry does not concentrate a welding current



and pressure at any spot in the lapped portions of two members and his welding is always accompanied by a modification or extrusion of metal. Perry's welding current is not concentrated by his electrodes; Perry's welding pressure is not concentrated by means of electrodes. The metal heated by Perry for welding and thereby softened is not surrounded by relatively cold metal. Perry does not weld without any modification of the work, and Perry's parts which are welded together move toward each other in the operation. The size of Perry's weld is not governed by the contact area of his electrodes, and it would be impossible for Perry to make one weld at a time between the members he welds in case more than one weld was required to unite these bodies; for according to Perry the bodies are only allowed to touch at a point contact. Perry's welding is within full view of the operator, as clearly shown in his Figures Nos. 4 and 6.

Perry was not dealing with the same order of things as Harmatta and his method of welding has nothing to do with Harmatta's method of welding.

Q. 19. Does the Parkinson British patent No. 14,536 of 1894 describe the subject-matter of the Harmatta patent in suit?

A. Parkinson's patent No. 14,536 of 1894 does not in any way describe the subject-matter of Harmatta's patent.

Parkinson's invention pertains to the old art of glutting together the component parts of a metallic wheel. Glutting is similar in a way to puttying. A carpenter or a painter will fill up a depression or a defection by the plastic material putty; the wheel maker fills up a depression or a groove by using metal made plastic by heat. This the wheel maker calls glutting. Parkinson has invented a machine for doing this glutting by electricity; that is, the metal used for glutting is made plastic after it has been placed in position and while it is being pressed against the depression to be filled. Parkinson's wheel is made up by assembling a number of hairpin-shaped spoke members. These members form the spokes and the circumference of the wheel. Around the circumference, between each spoke member, is a triangular depression and it is this depression which is to be filled up with Parkinson's glut piece, which is forced into the depression while it has been made plastic by the heat developed in it. The glut piece and the spokes where

they contact with the glut piece are brought to a welding heat before the glut piece is subject to the final pressure. This, according to Parkinson, causes the glut piece to fill up the depression and weld itself to the spoke members.

Parkinson's machine, as shown in his Figure No. 3, is a large jig, so that it properly locates the component parts of the wheel when these component parts are assembled in the machine. The spoke members are clamped between the contact arms L; each pair of these contact arms operates as a clamp and constitutes one pole of Parkinson's electric circuit. The other pole of Parkinson's electric circuit is a push-block, shown at M. This push-block M is symmetrically located over the depression formed between the spokes and into which the glut piece is placed. The circuit is so arranged that it passes between the push-block M and the clamp L, L, through the glut piece and the portions of the spoke in contact with the glut piece.

The contact arms or clamps L (page 3, line 7) are made to fit against the spokes; that is, they are provided with a proper radius so as to snugly fit into the curvatures of the spokes and to retain this curvature while the wheel is subjected to the great pressure required in glutting or welding. When the wheel is increased in size this curvature naturally becomes greater so that a thimble or cap is placed on the contact arms L so that they may be made to snugly fit into the curves. These thimbles are shown at L' in Figure No. 3 and are described by the inventor in his specification (page 3, line 8). The contact arms L are made wide, as shown in Figure No. 2, so that they will extend across the entire width of the wheel to resist the pressure transmitted from the push-block M by the glut piece which (page 4, line 15) is "forged to the width of the wheel". In case the contact arms L did not extend across the full width of the wheel, it would be only a portion of the wheel which would be rigidly secured in position and when the great welding pressure was exerted the wheel members would be bent out of shape.

After the parts of the wheel are assembled in Parkinson's machine, water is admitted to the pipes P, p. This causes the contact arms L, L to clamp the spokes together and causes the contact or push-block M to bear against the glut piece. The current is

then turned on and it flows through the glut piece and the portions of the spokes in contact with the glut piece, causing this metal to become entirely heated and plastic. When the metal has been raised to this high temperature the valve on pipes T,  $t'$  is open and die pieces  $b$ ,  $b'$  are pushed out over and under the glut piece, so that when the welding or glutting pressure is applied to compress the glut piece into place (page 2, line 33), it prevents it from unduly extruding although all the extrusion is not prevented. Parkinson's machine is of the multiple unit type and what we have described in connection with one glutting piece happens simultaneously at all the glutting pieces.

It should be noted that the contact arms L are wide and extend across the full face of the wheel (Figure No. 2) and that the push-block, or as Parkinson calls it the contact block, M, has a face larger than the top of the glut piece (Figure No. 3).

Parkinson is not dealing with an arrangement of work which is suitable or desirable to rivet, in fact, he is carrying out the art of glutting and not the art of rivetting and his new result is not a weld which will perfectly answer the purpose of a rivet, in fact, the work is not lapped in the same way as work is lapped for rivetting. In Parkinson's case there is no concentration of a welding current and a welding pressure at any spot in a lapped portion of the work. Parkinson's welding is not accompanied by a lack of modification, but is accompanied by extrusion, which is so great that he is obliged to provide die pieces in order to make his process in any way successful. The current for welding is not concentrated by the electrodes, the path for the current is determined by the top part of the glut piece and from an electrical standpoint the glut piece acts as a resistor for generating most of the heat used in the operation. The pressure for welding is not concentrated by electrodes. The metal softened for welding is not entirely surrounded by relatively cold metal, but is only partially surrounded by the die pieces which he provides. The weld is made rather slowly as it takes considerable time for his assembled joint to become uniformly heated; in fact, Parkinson must wait until his work becomes sufficiently heated (page 4, line 23). His welding consists in forcing the plastic glut piece into the depression formed between the spokes and therefore the work is subjected to a modification in the welding operation.

The glut piece is forced toward the spokes or compressed as Parkinson tells us (page 1, line 33) and therefore moves toward the spokes. The size of Parkinson's weld is not limited by the contact areas of his electrodes and it would be impossible according to Parkinson's machine to make several welds at different times, or even at the same time between the glut piece and the spokes, for it must be remembered that in glutting the whole glut piece is made plastic. The heating up to a welding temperature is done within full view of the operator, for it is not until after the glut piece becomes heated that the die pieces are brought into play.

Parkinson's machine deals with a process and a product totally different from the process and product of Harmatta's invention, with which it has practically nothing in common.

Q. 20. What result is obtained by the process of the Harmatta patent in suit?

A. The new result obtained by the process of Harmatta is a weld perfectly answering the purpose of a rivet.

Q. 21. Which, if any, of the patents in the prior art describes a process for obtaining that result?

A. I have no knowledge of any patent in the prior art which describes a process for obtaining that result.

Q. 22. Which, if any, of the patents in the prior art describes a process of electric welding in which the welding current and pressure are concentrated at any point in the meeting faces of two sheets of metal?

A. I know of no such patents.

Q. 23. Which, if any, of the patents of the prior art describes a process of electric welding in which the welding is performed without modification or mutilation of the work?

A. I know of no patent.

Q. 24. Which, if any, of the patents of the prior art describes a process of electric welding in which the current for welding is concentrated by an electrode?

A. I do not know of any patents with the current for electric welding concentrated by an electrode.

Q. 25. Which, if any, of the patents of the prior art describes a process of electric welding in which the pressure for welding is concentrated by the electrodes?

# CHART SHOWING COMPARISON OF HARMATTA'S PATENT NO. 1046066 WITH THE PREVIOUS ART

		STEPS IN HARMATTA PROCESS				CHARACTERISTICS OF HARMATTA PROCESS											
		1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12
		NEW RESULT OVERLAPPING THE SHEETS	CONCENTRATING WELDING CURRENT AND PRESSURE AT ANY SPOT	HEATING IN LINE OF CURRENT AND PRESSURE	WELDING WITHOUT MODIFICATION OR MUTILATION	HEATED BY OWN RESISTANCE	CURRENT FOR WELDING CONCENTRATED BY ELECTRODES	PRESSURE FOR WELDING CONCENTRATED BY ELECTRODES	SOFTENED METAL SURROUNDED BY COLD METAL	WELD MADE QUICKLY	NO MODIFICATION OF WORK INVOLVED IN WELDING	PARTS WELDED REMAIN STATIONARY	ELECTRODES REMAIN COLD DURING PROCESS	SIZE OF WELD LIMITED BY ELECTRODES AND CURRENT	ONE WELD CAN BE MADE AT A TIME	NO PREPARATORY MODIFICATION REQUIRED	WELD SURROUNDED AND CANNOT BE SEEN
ELECTRIC WELDING	NOT ELECTRIC WELDING	BENARDOS 363320															
		COFFIN 437571															
		BENARDOS (GER) 30909															
		THOMSON 498019															
		BLANCHARD 466266															
		LEMP 531197															
		BURTON 647694															
		THOMSON 396015															
		THOMSON 347140															
		THOMSON 347141															
		ROBINSON 574942															
		HEINSCHMIDT 616456															
ELECTRIC WELDING		THOMSON 444926															
		LEMP 533925															
		PERRY 670808															
		PARKINSON (BR 34) 14536															
		HARMATTA APPLICATION															
		HARMATTA 1046066															

District Court of the United States  
Eastern District of Michigan  
Southern Division  
Hansen Spelt Welder Co  
vs  
Fred Astor Co  
Plaintiff Exhibit No 13  
H. W. M.  
Atty. Gen.



A. I know of no patent of the prior art.

Q. 26. Which, if any, of the patents of the prior art describes a process of electric welding in which the metal softened for welding is surrounded by cold metal?

A. None of the patents that I know of show a process of electric welding where the metal softened for welding is enclosed by cold metal.

Q. 27. Which, if any, of the patents of the prior art describes a process of electric welding in which there is no modification of the work involved in the welding operation?

A. I know of no patents.

Q. 28. Which, if any, of the patents of the prior art describes a process of electric welding in which the parts welded remain stationary with relation to one another under the welding operation?

A. I do not know of any patents.

Q. 29. Mr. Dyer, defendant's expert, in answer to X-Q. 112, has referred to the patents of the prior art "as if an authoritative book had been written on the subject" of spot welding. What have you to say briefly concerning the prior art as an authoritative book on that subject?

A. I have bunched together the patents to which Mr. Dyer refers and which was called by him an authoritative book on the subject, and I have condensed these patents into the form of a chart or index so that the subject-matter of all these patents can be quickly and conveniently observed, and I find that Mr. Dyer's so-called book has many pages missing. The chart or index to which I refer tabulates the patents of the previous art, classifying them as to whether they are not electric welding or are true electric welding patents. The patents are further sub-divided into those pertaining to arc welding, hot resistor welding, soldering, heating only, rivetting, butt welding, seam welding, cross-wire welding and glut welding. Harmatta's spot welding patent is also included, together with the disclosures of Harmatta's original application. The various properties of the Harmatta process are also indicated on the chart, consisting of Harmatta's new result, the steps in Harmatta's process and the characteristics of Harmatta's process. The shaded portions indicate the agreement between the Harmatta patent and the patents of the previous art, and the unshaded por-



tions or squares indicate a disagreement between the patents of the previous art and Harmatta. It is therefore very easy to compare Mr. Dyer's so-called book with the disclosures of Harmatta. If the book which Mr. Dyer considers authoritative was really so, there would be no columns in the chart entirely free from shading, like the column devoted to the second and fourth steps in Harmatta's process; the column devoted to Harmatta's new result; or columns indicating characteristics Nos. 2, 3, 4, 6, 9, 10 and 12. According to the chart, Mr. Dyer is not, according to my mind, a good judge of authoritative literature.

(Counsel for complainant offers in evidence the chart produced by the witness, and the same is marked "Plaintiff's Exhibit No. 13, Chart Showing Comparison of Harmatta's Patent No. 1,046,066 with the Previous Art".)

Q. 30. Which of the patents of the prior art were you familiar with before you knew of the Harmatta process?

A. Early in 1901 I made and had made a search of the Patent Office to secure all the patents pertaining to electric welding. The collection of patents which I secured at that time included all the patents mentioned in my testimony with the exception of Bernados' German patent No. 50,909 and Parkinson's British patent of 1894, No. 14,536, and with the possible exception of Robinson's patent No. 574,942.

Q. 31. Did the knowledge of these patents suggest to your mind the process of the Harmatta patent in suit?

A. These patents did not suggest to my mind in any way the subject-matter of Harmatta's patent in suit, which they no doubt would have done if Harmatta's ideas had been present. I was employed at that time, while these patents were in my possession, at the works of the American Tube & Stamping Company in Bridgeport, Connecticut. My duties were to develop new processes of welding and it would have been to my great financial benefit if I had been able at that time to propose Harmatta's method of welding so that an electric weld could be used to perfectly answer the purpose of a rivet. The American Tube & Stamping Company had many conditions to which the Harmatta weld could be applied and it would have been to their great benefit to have had such a process.

But in spite of all this the idea of Harmatta's spot weld never came into my mind.

Direct examination closed.

### Cross Examination.

By Mr. CHURCH.

X-Q. 32. I hold in my hand a publication entitled "Electric Welding" by Douglas T. Hamilton, A. S. M. E., and Erik Oberg, A. S. M. E., published in New York by the Industrial Press and in London by the Machinery Publishing Company, Limited, and bearing the imprint 1918. On page 2 of this publication I find the following:

#### *"Different Systems of Electric Welding.*

"The principle of electric welding is simple; the parts that are to be welded together are heated to a welding temperature by means of an electric current. There are two ways in which the electric current can be utilized for heating to a welding temperature, and, according to the methods used, two main processes or systems of electric welding may be distinguished - the electric resistance-welding process and the electric arc-welding process. In the former - the resistance-welding process - the parts to be welded are brought to a welding heat by the passage through them of an electric current of such voltage and amperage that the resistance to the flow of the current is great enough to produce sufficient heat at the points or surfaces to be welded, so that, when the parts are brought together by a slight pressure, they will be joined by the fusing of the metal, - that is, by welding. In the latter system - the arc-welding method - an electric arc is drawn between two electrodes or between the work and one electrode. This arc is brought into such a position relative to the work that the heat from the arc melts the metal to be welded, and enables the parts to be united. There are various modifications of this latter process, but, in principle, the above description is correct."

Do you agree or disagree with this description of the different kinds of electric welding?

A. Viewed from a purely popular sense the statements are such as to give to the lay mind a general idea of Thomson's electric welding process which he termed electric welding and the arc blow-pipe

effect which the author has termed arc-welding. According to my idea, we should retain Thomson's coined phrase "electric welding" to represent what the author terms resistance-welding. From a scientific point of view the author's description of the electric welding process which he terms resistance-welding is rather misleading because it is not entirely accurate. He tells us that in the electric welding or resistance process the pressure used is very slight, yet Kleinschmidt in his patent No. 616,436 in describing his process which had an extended commercial use tells us that the pressure used in his process is about 25,000 pounds (page 2, line 3, Kleinschmidt's patent No. 616,436). The Kleinschmidt process is a true electric welding one, or one using what the authors of your book call the resistance process. Twenty-five thousand pounds does not appeal to me as being a very slight pressure. I therefore cannot say that I entirely agree with the quotation which you have read.

X-Q. 33. In the same publication referred to I find on page 96, under the heading "Relation of Time to Current and Pressure in Spot Welding", the following:—

"There are four vital points that must be taken into consideration in making a satisfactory spot weld. They are: 1. Condition of stock, whether pickled, oxide-coated, coated with zinc, lead, etc. 2. Time required to make the weld. 3. Pressure on electrodes which should bear a direct relation to the current used and the time taken to make the weld. 4. Amount of current passing through the secondary circuit. An increase in the pressure necessitates an increase in the amperage of the current; and the lower the amperage, the greater the length of time required to complete the weld, and vice versa. As the thickness of the stock increases, the pressure and current should be increased."

What have you to say as to the correctness or incorrectness of this statement?

A. The statements are generally correct.

X-Q. 34. On pages 118, 119 of this publication I find the following (I quote from the last paragraph on page 118):—

"The generally accepted idea that spot welding is practical to only as high as one-eighth inch thickness of sheet is fully disproved in recent practice. By the use of simple methods, there is practi-

cally no limit to the thickness which can be spot welded. This is indicated in Fig. 20 where two bars each seven-eighths inch thick have been spot welded together. The operation took about one minute."

Have you any reason to doubt the correctness of this statement?

A. Viewed as an experimental feat, I have no reason to doubt this statement.

×-Q. 35. From the same publication I quote the following under the head "Spot Welding" (page 95) : —

"Tin can be welded to tin or to sheet iron but the stock will be discolored at the weld."

(Page 97 :) "In welding brass, galvanized iron, tin, terneplate, German silver, aluminium, sherardized steel, and all coated materials, it is advisable to use less pressure between the electrode points."

(Page 98 :) "In welding tin —, lead —, or zinc-coated iron, both the upper and the lower electrodes are pointed."

Have you any reason to doubt the accuracy of these statements as to the spot welding of metal-coated metals?

A. As long as I understand that you refer to steel covered with various coatings I have no doubt that the results described can be obtained.

×-Q. 36. Do you read German?

A. No, I do not.

×-Q. 37. Upon what translation of the Bernados German patent did you rely in giving your testimony concerning the disclosure of that patent?

A. In discussing Bernados' patent I rely on the translation of Bernados' German patent by Mr. Brandt.

×-Q. 38. How does an ordinary blacksmith determine when two pieces of metal to be united by welding have reached the proper welding temperature?

A. By judging from the color of the heat.

×-Q. 39. In other words it is by visual inspection or observation?

A. Yes.

×-Q. 40. In like manner, does not the operator of a spot welding machine observe the color of the heat spot and govern the duration of pressure and current accordingly?

A. No; because the spot heated for welding is covered up by the tips of the tools, so he cannot actually see the spot which he is heating for welding.

×-Q. 41. He does, however, observe the color of the heat spot on the exterior of the parts being welded and govern himself accordingly?

A. I cannot agree with you.

×-Q. 42. Are you a practical spot welder?

A. Yes.

×-Q. 43. If you were welding together by a spot welding machine one-eighth inch plates, how would you know when you had accomplished or obtained a spot weld?

A. By testing the work after it was processed.

×-Q. 44. As a matter of fact, in the operation of a spot welding machine, is there not an observable spot visible around the electrode or electrodes that grows brighter and brighter as the application of pressure and current is continued?

A. This only happens in case the current is continued for a much longer time than is required to make the weld and would be disastrous to the work.

×-Q. 45. What would be disastrous to the work?

A. Allowing the heat to soak away off around the desirable spot for welding. Such excessive heat was not contemplated by Har-matta, and would not produce an unscarred sample of work. In case of very thin work it would cause the work to buckle. Besides, if a welder had to rely on allowing his heat to spread out before he interrupted the current, it would make the process very slow.

×-Q. 46. Are you prepared to affirm that a practical spot welder pays no attention at all to the appearance of the heat spot surrounding the electrode during the application of the requisite heat and pressure to effect a weld?

A. I am prepared to affirm that a practical spot welder (and I understand you to mean by practical welder one engaged in commercial work) pays no attention whatever to heat markings of the work so as to govern his application of current and pressure.

×-Q. 47. In the spot welding of articles like the mufflers offered in evidence to establish the alleged infringement of the defendant

in this case, what would happen if the current and pressure were maintained too long?

A. That would depend entirely on the amount of current the machine was set to give. If the machine was adjusted for a very moderate current, just sufficient to make a weld, the oxidization marks around the tool would be materially increased. If, however, the machine was set to give a very large current, the metal directly under the tools would become melted and a hole would be made instead of a weld.

X-Q. 48. By oxidization marks around the tool do you refer to the visible heated area that is more or less bright to the eye?

A. No; I mean the oxidization which is produced by the metal under the tool distributing its heat to the surrounding area, or running back on the work, the same way that the heat runs back on the work when a blacksmith tempers a tool. If the current is only on for a short time and the work immediately removed from the machine, it is no doubt that these heat markings can be seen spreading out as the heated spot cools off. These heat marks can be produced at a temperature below a red heat and therefore the heat markings would appear at places which had not been visibly hot.

X-Q. 49. You would not have the court believe, would you, that in the operation of an ordinary spot welding machine there is not observable a heat spot more or less intensely red around the electrode or tool?

A. I can only speak from my own observation and my own practice, according to which there is no heat spot around the tool which would guide anyone in the regulation of the current and pressure.

X-Q. 50. Question repeated.

A. In case a very weak current is used and we have to wait for an appreciable time for the metal to become heated the metal may become visibly red hot around the tool.

X-Q. 51. And the same would be true if a very heavy current were used for uniting relatively thick plates, except that in the latter case the visible ring or spot would be more pronounced. Do I state the matter correctly?

A. I have never seen the welding of very heavy plates carried out commercially, but as it is very difficult to secure enough current

for such work I imagine that the work would be heated rather slowly and that a red heat would be observable around the tool.

×-Q. 52. If it were so observable, it would still be the so-called Harmatta process, wouldn't it?

A. I believe it would be so called.

×-Q. 53. Referring now to the Burton patent No. 647,694, is not the apparatus therein shown and described intended to bring the parts of the article to be united to a welding temperature by an electric current of large volume and low voltage?

A. Yes.

×-Q. 54. Are not the parts of the work to be united pressed between electrodes carrying the electric current?

A. They are placed between electrodes carrying the current. The inventor says the electrodes are brought in contact with the work, but he does not give the idea that the electrodes exert sufficient pressure to warrant me admitting that the work is pressed between the electrodes.

×-Q. 55. Without pressure no welding current would pass, would it?

A. Theoretically, there must be contact, but not necessarily pressure. If we consider that which holds the electrodes in contact with the work pressure, then pressure is exerted by the electrodes, but if we consider pressure that which is powerful enough and that which is used to upset the work, then no pressure exists.

×-Q. 56. Does not this patentee Burton specifically provide pressure apparatus quite comparable to the pressure apparatus of an ordinary spot welding machine?

A. It is not comparable to the pressure devices of the spot welding machines which I have seen. It will be noted that there is less pressure applied to the work than is applied at the pedal, owing to the mechanical arrangement of the parts. The spot welding machines I have seen exert more pressure to the work than is applied to the operating lever.

×-Q. 57. Mr. Dyer, defendant's expert, has told us that the pressure required and actually used in an ordinary spot welding machine for the spot welding of thin plates was not greater than that which the hand can bear when interposed between electrodes. Do you controvert that statement?



A. It is quite true that in welding thin metals with a very small weld that the hand can withstand the pressure of the tool. This is no doubt due to the fact that the tool is bluntly pointed so that the pressure is distributed over a larger area over the hand than it is on the work. If the contact area of the tool was carried back straight instead of tapered, it would be much more difficult for the flesh of the hand to resist the pressure. It must also be remembered when making a small weld that the area of the contacting tool is very small, and therefore the total pressure required may not appear very great, but if we consider this pressure as so many pounds per square inch, then the pressure exerted on the work would seem quite large.

×-Q. 58. While we are on this subject of pressure, will you tell us what instrumentality is shown in the Harmatta patent for applying pressure to the electrode?

A. A simple hand lever, shown at *e* in Harmatta's Figure No. 2, acting in connection with the fulcrum *f* is used for transmitting the pressure from the operator to the work. The distance between the fulcrum and the work is very much smaller than between the point where the lever is grasped by the hand and the fulcrum, so that the pressure acting on the work is multiplied over the pressure which is exerted at the handle of the lever. It should be noted that this hand lever is long, too long to be placed in its entirety in the drawing and therefore it is shown broken, with a part removed.

×-Q. 59. What is said in the Harmatta patent about the extent of the pressure to be applied?

A. The amount of pressure can be readily determined by experiment. That is, the amount of pressure applied by the hand to the lever shown in Figure No. 2 may be varied by the hand according to "the different sizes or thicknesses of the metal".

×-Q. 60. Are you prepared to say that with an apparatus such as shown in the Burton patent a sufficient pressure could not be obtained between the upper and lower electrodes for the purposes of making a spot weld, provided the electrodes were of suitable form?

A. If we selected very thin sheets and a very small tool, I have no doubt sufficient pressure could be exerted to that required in spot welding.

X-Q. 61. And if you desired to unite thicker sheets, do you think it would be much of an engineering job to contrive to apply more pressure if more pressure were needed?

A. I consider it quite an engineering job to exert sufficient pressure with Burton's apparatus; in fact, I would consider it an impossible job. In the first place, it would be impossible to exert even the weight of a man on the lever or foot pedal shown in Burton's figure, for the conductor 120 and the work itself would prevent a man from standing on the lever.

X-Q. 62. Does not the Burton patent say that the current may pass in either direction from the generator with the same result?

A. Yes.

X-Q. 63. What do you understand him to mean by that?

A. I understand him to mean by that that the conductor 150 and the conductor 120 can be made of either polarity without influencing the results of his machine.

X-Q. 64. Considering that the apparent object of the Burton appliance is to raise the temperature of the parts to be united to a welding temperature, what would be your idea of the proper materials to be employed for the electrodes to effect this purpose?

A. Considering the construction shown by Burton, I had a tendency when you first asked the question to say that his contact electrodes would be of copper, which he tells us is the case with the lower electrode or the block attached to the anvil (page 1, line 103); but viewing the arrangement of his machine in the light of practice I cannot see how even copper could be used without it getting hot and soft, for it is well shown in Burton's constructions that these blocks of copper are intended to contact over large areas with the heated metal, and I cannot possibly see how the heat conducted into the copper can be dissipated.

If I was going to construct Burton's machine I would suppose that his electrodes were made of copper, but I am afraid my machine would not be at all satisfactory.

X-Q. 65. Assuming, for instance, that the upper electrode of the turret has a spherical end, such as that numbered 240, and that it co-operates with a plane bed electrode or with a corresponding spherical electrode, can you imagine a smaller contacting surface applied to the work than that afforded by the perimeter of a sphere?

A. If your sphere is of perfectly rigid material and the work is of perfectly rigid material and the electrode coacting with the ball is of perfectly rigid material and the work does not get hot and soft, I cannot imagine a smaller contact, because the contact is a point.

×-Q. 66. Take Figure 6 of the Burton patent, for instance; do you not understand that the proximate diagonal faces of the parts there shown are the faces to be welded together?

A. Yes.

×-Q. 67. How do you understand the electric current is to be applied so as to bring those proximate diagonal faces to a welding temperature?

A. In the same manner as the inventor shows in his Figure No. 2. The parts are assembled between the electrode 210 and the electrode 100, still retaining their position as shown in Figure No. 6, the current passing from one electrode to the other across the overlapping ends, but not necessarily across the joint.

×-Q. 68. Is it your idea that the overlapping ends of the work are held or clamped between the electrodes 210 and 100?

A. I can't say that my idea is that they are clamped between these two electrodes, because to my mind clamping implies exerting considerable pressure. My idea is they are placed between the two electrodes so that both electrodes make contact with both pieces.

×-Q. 69. If they are placed between the two electrodes and the foot lever is brought down, would it not follow that the diagonal faces of the parts to be united would be brought into contact?

A. No, this would not be the case. If they were separated before they are placed under the electrodes they would stay separated when the foot lever was depressed.

×-Q. 70. What would prevent them from coming in contact under the pressure of the electrode?

A. The unchamfered portions of the work in close proximity to the chamfered portions of the work.

×-Q. 71. If the object of the whole scheme is to raise to a welding temperature the inclined proximate faces of the work, isn't it entirely reasonable to suppose that the electric current is intended to be applied directly to those parts instead of to some part of the work remote from those parts?

A. I do not know that the object of the invention is to raise

simply the faces of the work to be welded to a welding temperature, and when I consider the other constructions shown by the inventor I believe his object was to generally heat the work in the same way that it is generally heated in a blacksmith's forge.

×-Q. 72. Question repeated.

A. I cannot agree with you in supposing the whole scheme to be to raise to a welding temperature simply the inclined proximate faces of the work.

×-Q. 73. Turning now to Figure No. 13 of the Burton patent, the ends, both ends, of the rivet shown through the overlapped plates are apparently upset. What according to your reading of the patent has caused this upsetting?

A. According to Figure No. 13 of my Burton patent the rivet is not shown upset.

×-Q. 74. According to your interpretation of the Burton patent, what is the apparatus shown in Figure No. 13 intended to accomplish?

A. I can only form my ideas from what the inventor says, and he distinctly states that "Figure No. 13 represents a vertical longitudinal section of one end of the anvil and of wheel and anvil electrodes adapted for rivetting" (page 1, line 60). This is the only description of Figure No. 13 which I know of in the patent. According to my interpretation of the patent I should consider that the inventor was trying to show the type of electrodes he used when he intended to set a rivet but had made a very poor job of it.

(Adjourned to Friday, November 15, at 9.30 A. M.)

BOSTON, MASS., November 15, 1918, 9.30 A. M.

Met pursuant to adjournment.

Present, counsel as before.

×-Q. 75. As an engineer supposedly skilled in the art of electric welding, I would ask you to tell us how you would proceed to apply a rivet according to the disclosure of the Burton patent, Figure No. 13.

A. Burton's disclosures are so vague relative to a rivet that I would not know how to proceed according to Burton's disclosures.

×-Q. 76. Well, suppose you were to use your own wits, how do

you think a rivet might be applied by the appliances shown in Figure No. 13?

A. Figure No. 13 does not in any way show how to apply a rivet. If anything, it shows a rivet which has already been applied.

X-Q. 77. Do you not gather from the Burton patent that Figure No. 13, taken in connection with the specification of the patent, is designed to show or illustrate a method of utilizing a welding electric current in the application of a rivet to two overlapped plates of metal?

A. I cannot admit that Burton uses an electric welding current in the true sense of the term, neither is there anything in the specification which would especially lead me to know whether or not Burton uses any current at all in connection with what he says illustrates a rivetting idea.

X-Q. 78. Question repeated.

A. The specification is so vague that I really gather nothing from the specification, and if I had not a knowledge of the art derived from other sources than Burton's patent I would not be able to gather anything of any account from Burton's illustration No. 13 and his only description of it (page 1, line 60).

X-Q. 79. I am of course asking you to consider not only what Burton says in his specification but to take into account also that vast knowledge of the art of electric welding that you are supposed as an expert to have. With this understanding, will you please tell us how a rivet could be applied in accordance with the disclosure of Figure No. 13 of the Burton patent?

A. My vast knowledge of the art of electric welding must be augmented by a vast knowledge of electric rivetting, and supposing that I have a vast knowledge of both subjects I will answer your question. In order to electric rivet I would proceed as Thomson describes in his patent No. 396,015. I would provide a hole in each part to be rivetted; I would lap the work so that the holes registered; I would pass a rivet blank through the holes and I would apply electrodes which contacted with the rivet blank only. I would then turn on the current and allow it to act until the rivet blank became sufficiently heated. I would then force the electrodes together and turn off the current. That is the way I would pro-

ceed to electric rivet, but I cannot see any disclosures of this nature in Burton's patent.

×-Q. 80. Will you now please, by the exercise of your profound knowledge as an engineer, mechanic and expert, tell us how you could possibly devise a way of locating the foot piece of the foot treadle shown in Figure No. 1 of the Burton patent so as to enable the operator to apply his full weight to it?

A. If the parts were changed around so that the foot lever was not located directly under the conductor 120 and if smaller work was placed in the heating apparatus so that it would not be in the operator's way, a man then could stand on the foot lever. (Very little of my vast knowledge is used in giving this answer.)

×-Q. 81. Do you understand that the foot lever 180 is located immediately beneath the conductor 120?

A. The foot lever is, but the pedal on which the foot rests extends slightly forward.

×-Q. 82. In other words, the foot piece is out of the plane of the conductor 120 and the body of the foot lever. Am I right about this?

A. Yes.

×-Q. 83. Don't you think it is unfair and trivial to suggest, therefore, that the foot lever or treadle of the Burton patent is not intended to be entirely available so that if necessary the full weight of the operator may be applied to it?

A. No, I do not think that such an answer is unfair and trivial, because such answers indicate my opinion of the whole patent, that it is a very impractical and crude disclosure, and it is only by bringing out such points as the position of the foot lever that calls our attention to the crudeness of the invention. The foot lever in the patent does have the pedal extending slightly forward but the width of this pedal is such as would not accommodate the whole foot of a man. If a man should operate it, while facing the apparatus, with his right foot, he could not balance his body on the lever. He would therefore have to straddle the conductor 120 and operate the machine with his left foot, and although I must admit that if the work is not too large he could by straddling the conductor get the whole weight of his body on the foot lever, yet I do not believe the inventor intended the machine to be used in this manner.

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X-Q. 84. If any such difficulty as you suggest should arise in the attempt to operate the Burton machine, do you think it would be insuperable and beyond your engineering skill to remedy?

A. Your question presupposes that the Burton machine is operative, and personally I do not believe the machine is operative, and there is a question in my mind if I could make a machine along the lines that Burton shows to satisfactorily operate. I have never seen such a machine in operation and I have never seen work in actual practice carried out as Burton proposes. Coming back to the foot lever in question, if that was the only part which prohibited the commercial working of the machine, I think my engineering skill would be sufficient to provide a remedy.

X-Q. 85. What great thing would you do to solve this difficult problem?

A. If this difficult problem to which you refer was to place the foot lever in an operative position, I would probably turn the anvil through 90 degrees, arranging the conductor 120 accordingly.

X-Q. 86. In other words, you would adjust the whole machine around the foot lever, thereby making the tail wag the dog. Is that what you mean?

A. What I mean is I would relatively change the position of the parts so that they would not interfere.

X-Q. 87. Coming back to Figure No. 6 of the patent, what do you regard as the overlapping ends of that figure? Where do the overlapping ends begin and end?

A. Truly speaking, the ends in their entirety do not overlap. It is only a portion of the ends of the members which overlap, parts of the ends having been removed by scarfing. Truly speaking, the metal has been prepared for scarf welding and not for lap welding. It is the scarfed portions of the two ends which may be said to be overlapped.

X-Q. 88. Do you mean to say, then, that the wedge-shaped extremities of the ends are overlapped? Is that a fair statement?

A. Yes.

X-Q. 89. When the patent of Burton says "The current passes through the work in transverse direction across the overlapping ends of the parts", it doesn't mean that the current does not pass



through the work in transverse direction across the overlapping ends of the parts, does it?

A. The current may pass, according to the inventor, "through the work in transverse direction across the overlapping ends of the parts to be heated" without necessarily passing across the joint. Figure No. 11 distinctly shows this. In this figure it would be impossible for any current to pass across the joint, yet as the electrodes are made very broad it is plainly evident to anybody that the current will pass across the overlapping ends but will not pass across the joint, because the joint is open. Even if the joint was closed, only a very small portion of the current would pass across the joint.

×-Q. 90. When the Burton patent says (page 2, line 78) that "the piece is heated to the proper temperature", it means proper welding temperature, does it not?

A. Not necessarily, because the inventor (page 1, line 9) tells us that the invention may be used for forging or brazing or for setting. After telling us, according to your quotation, that the work is brought to a proper temperature he says that the work is in the proper condition so that it may be moved forward on the anvil, so that the joint may be hammered or otherwise finished. The proper temperature then is the proper temperature for the operation which is to follow, that is, welding, forging or brazing, and I might add, due to Figure No. 13, rivetting.

×-Q. 91. Now, will you not be fair enough to counsel and to the court to admit that the statement quoted in my last question as to proper temperature is found in the description of the use of the apparatus in the lap welding of pieces, said description beginning page 2, line 67?

A. I have already admitted that when the subsequent operation is to be welding that the parts are raised to this welding temperature, and if we confine our attention solely to line 67, it is my opinion that the parts are brought to a welding temperature before they are removed from Burton's heating apparatus.

×-Q. 92. Do you regard it as a fair definition of electric welding to say that it is a process in which the work is brought to the welding temperature by internal heat generated by the resistance of the

work itself to the passage of an electric current at the place of contact between the parts to be joined by the welding pressure?

A. I do not, as your definition implies it is only the contact resistance which is to be considered.

X-Q. 93. You do not think then that that is a good definition of electric welding?

A. Not strictly speaking.

X-Q. 94. I now draw your attention to the fact that I have embodied in my question word for word the definition of electric welding given in the Harmatta patent on page 1, second column. Does this change your ideas about the matter?

A. No, it does not.

X-Q. 95. Is the process of electric welding as defined in X-Q. 92 carried out in the practice of the method disclosed in the Robinson patent?

A. Robinson is very vague in his descriptions of the process he employs. It is my opinion, however, that heat would be developed not only at the contact between the ends of his projections and the web of the rail, but also in the shank of the projection.

X-Q. 96. Question repeated. Will you please answer yes or no?

A. It is not definitely disclosed by Robinson what his idea of electric welding is, but if it answers to the true definition of the term electric welding, heat is developed not only at the actual contact between the bodies but also in the body of the projection itself, and therefore according to Robinson the heat at the joint itself is reinforced by the heat developed in the projection and the resistance of both must be considered in our definition.

X-Q. 97. Question repeated.

A. In one sense yes, and in another sense no. There is heat developed at the joint by the initial resistance of the joint which immediately heats when the current is applied, but this initial resistance of the joint quickly lessens and the resistance of the shank of the projection quickly increases due to its increased resistance by the passage of the current through it, causing it to heat and add resistance and this added resistance causes it to heat more, so that at the initial stages of Robinson's weld the resistance of the joint may be the big factor, but at the following stages the resistance of the metal through which the current is flowing

adjacent to the weld is the big factor. Both of these conditions must be taken into account in the general definition of electric welding.

×-Q. 98. Is electric welding as defined in my X-Q. 92 and as defined in the Harmatta patent practiced in carrying out the method of the Kleinschmidt patent? Please answer yes or no.

A. It is my opinion that Harmatta means by saying "at the place of contact between the parts to be joined" the general location at the parts to be joined and not just the contact faces only between the two bodies being joined. It is my opinion that Kleinschmidt was dealing with a true electric welding process just the same as Harmatta was dealing with a true electric welding process. It is also my opinion that your definition only takes into account the initial heating stages which occur in the electric welding process, or, in other words, limits the heating effect entirely to a contact resistance between the work and leaves out the idea of the resistance of the work itself.

×-Q. 99. Question repeated.

A. I cannot answer your question yes or no because I do not believe your definition gives the same idea as is implied by the Harmatta patent.

×-Q. 100. Is electric welding, as defined in my X-Q. 92, and in the Harmatta patent itself in the same words, practiced in the carrying out of the process disclosed in the Rietzel patent No. 928,701?

A. The purely contact resistance between the parts to be welded seems to have been used more by Rietzel than by previous inventors, and if I understand your definition of electric welding to simply embody the idea that it is only the contact resistance between the surfaces which furnishes the heat, Rietzel approaches more your definition of electric welding, for it will be noted that in Rietzel he makes his projections pointed and speaks of them throughout the specification as points, and this shape of projections naturally makes the resistance right at the joint greater than elsewhere. Even in Rietzel's case it is really the resistance of the work itself immediately at the point of contact, together with the resistance of the joint between the parts, which causes the heat he uses in his operation.

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X-Q. 101. You cannot, then, answer my question categorically yes or no?

A. As both the contact resistance at the start of the weld and the resistance of the work itself immediately in contact with these portions comes into play, I cannot answer your question either yes or no.

X-Q. 102. Is the definition of electric welding contained in my cross-question 92, and in the same words in the Harmatta patent itself, applicable to the process of electric welding set forth in the Harmatta patent?

A. On re-reading your question X-Q. 92 you say "the resistance of the work itself", which I shall hereafter regard as meaning the resistance of the work itself, and not my former interpretation of your words which were tempered to my mind by your following passage, "at the place of contact between the parts". Your definition to my mind implied a paradoxical idea because there is such a thing as a contact resistance and you speak of this place of contact as being between the parts to be welded, and I cannot imagine any portions of the work themselves as being "between the parts to be joined". I therefore shall in the future treat your question as though you mean the first part of your question, which relates to the "internal heat generated by the resistance of the work itself". I now answer your question by saying yes.

X-Q. 103. Now, in view of the great light that has broken in upon you, would you not also say that electric welding as defined in my X-Q. 92, and in the same words in the Harmatta patent, applies to Rietzel?

A. Yes.

X-Q. 104. And applies to Kleinschmidt?

A. Yes.

X-Q. 105. And applies to Robinson?

A. Yes.

X-Q. 106. Does not each of the welds produced according to the process disclosed in the Rietzel patent answer the purpose of a rivet and is it not so stated in the patent?

A. No, not in every case. It will be noted that although in some cases Rietzel's welds may be used as rivets, as stated by the inventor, yet in other cases they will not perfectly answer the pur-

pose of a rivet. For instance, if it is desired to place in the head of a steel barrel by Rietzel's process and this head is made to fit perfectly for rivetting, the placing of the projections on the work would prohibit the head of the barrel being put in place. The barrel could be made by rivetting but it could not be made satisfactorily in a commercial way by the Rietzel process owing to the fact that the projections would interfere with the placing of the parts. In cases where the movement of the parts toward each other in the operation are not objectionable the Rietzel process may in some cases be used instead of rivetting.

×-Q. 107. Give an instance.

A. The making of steel pulleys, for instance, are made very satisfactorily by the Rietzel process.

×-Q. 108. And in that case the welds perfectly answer the purposes of rivets, do they not?

A. Although I have never been intimately associated with the industry of making steel pulleys, I should think that the Rietzel welds would answer the purpose of a rivet.

×-Q. 109. Does not the Rietzel patent disclose metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the back of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas? This is the language of claim 16 of the Rietzel patent as originally granted.

A. Yes.

×-Q. 110. Does not the Rietzel patent show sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only, each surrounded by distinct areas of unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots? This is the 17th claim of the Rietzel patent.

A. No, the Rietzel patent does not show these parts welded; it shows them before they are welded. After the welding operation I have no doubt that the work would be as described.

×-Q. 111. Does not the Rietzel patent disclose composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said

spots being each entirely surrounded by distinct areas of unwelded union and the portion of the pieces back of the welds being substantially unaltered? This is the 18th claim of the Rietzel patent.

A. Yes.

×-Q. 112. Does not the Rietzel patent also disclose metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered over said spot? This is the 19th claim of the Rietzel patent.

A. Yes.

×-Q. 113. Does not the Rietzel patent disclose a metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaced and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points? This is the 20th claim of the Rietzel patent.

A. Yes.

×-Q. 114. Does not the Rietzel patent also disclose the method of uniting two pieces of metal consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area, as compared with the area of the immediately opposed surfaces, so as to limit the union of the pieces to a spot or spots? This is the 3d claim of the Rietzel patent?

A. Yes, it discloses the method of doing this according to Rietzel.

×-Q. 115. Does the patent of Rietzel disclose butt welding or spot welding, or both?

A. The Rietzel patent really discloses the method of butt welding, rather than what to my mind is truly spot welding.

×-Q. 116. Does it disclose spot welding at all?

A. It discloses a method of uniting sheets at spots, and whether it discloses spot welding or not depends entirely upon the definition of spot welding.

×-Q. 117. In the course of the two depositions that you have

given, you have several times undertaken to define what you consider to be spot welding. I therefore now ask you whether the Rietzel patent discloses what you have thus defined as spot welding?

A. According to my definition of spot welding, the Rietzel patent does not disclose spot welding.

Cross-examination closed.

Redirect Examination.

By Mr. STACKPOLE.

RDQ. 118. In the book on Electric Welding by Messrs. Hamilton and Oberg, to which your attention was called in the cross-examination, I find on page 107 in the chapter devoted to spot welding the following statement :—

“Strength of spot welded joint.—One of the chief advantages of electric spot welding is that it takes the place of riveting on many classes of work, and not only does the work more rapidly, but also more effectively. For instance, an electric spot-welded joint is stronger than a riveted joint.”

Do you agree with this statement?

A. Yes.

(Counsel for defendant requests counsel for plaintiff to state upon what claims of the Harmatta patent the plaintiff proposes to press for a decree.)

(By Mr. STACKPOLE. As at present advised and subject to future limitation, counsel for plaintiff states that plaintiff will rely on all of the claims of the Harmatta patent.)

(Adjourned subject to further notice.)

JAMES H. GRAVELL.

I, Hector M. Holmes, a Notary Public within and for the Commonwealth of Massachusetts, do hereby certify that the foregoing deposition of James H. Gravelle was taken on behalf of the plaintiff in the suit of *Thomson Spot Welder Company v. Ford Motor Company*, in pursuance to agreement of counsel, before me as Special Examiner, at Boston, in the County of Suffolk and Commonwealth of Massachusetts; that the said deposition was taken on the eleventh, twelfth, thirteenth, fourteenth and fifteenth days of November, 1918; that said witness was by me sworn to tell the truth, the



whole truth and nothing but the truth; that his testimony was written out in his presence on a typewriter by a skilled operator; that the opposing party was represented by counsel during the taking of said testimony, as appears by the record of said testimony; that by agreement of counsel the testimony was taken in my absence, and that I am not connected by blood or marriage with either of said parties, nor interested directly or indirectly in the matter in controversy.

In witness whereof I have hereunto set my hand and notarial seal at Boston, in the Commonwealth of Massachusetts, this fifteenth day of November, 1918.

HECTOR M. HOLMES,

[SEAL]

*Notary Public and Special Examiner.*

BOSTON, November 14, 1918, at 12 M.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, Esq., of Counsel for Plaintiff;

MELVILLE CHURCH, Esq., of Counsel for Defendant.

WALTER BRANDT, having been first duly sworn, doth depose and say as follows:—

Direct Examination.

By Mr. STACKPOLE.

Q. 1. What is your name, age, residence and occupation?

A. Walter Brandt; age, thirty-six years; residence, 36 Wren Street, West Roxbury, Mass.; occupation, assistant in the patent department of the United Shoe Machinery Corporation.

Q. 2. Are you familiar with the German language?

A. Yes.

Q. 3. Have you had experience in the translating of German patents into English and of translating English specifications into German?

A. Yes; during more than the past twelve years.

Q. 4. What has been your general experience in qualifying you to do this work?

A. I was born in Munich, Bavaria, and received my education in Munich and in the University of Heidelberg. After graduating there I became connected with the United Shoe Machinery Com-

pany in 1906 as assistant in their patent department and have been continuously employed there since that date. During the past twelve years I have prepared and prosecuted patent applications in Germany, Austria and all countries in which the German language is used officially in patent matters.

Q. 5. I asked you the other day to make a translation of the German patent No. 50,909 to Nikolas von Bernados. Have you done so?

A. Yes.

Q. 6. Please produce a copy of that translation.

A. I here produce it.

Q. 7. Was this translation made by you?

A. Yes.

Q. 8. From the German text?

A. Yes.

(Counsel for plaintiff offers in evidence the translation of the Bernados patent produced by the witness, and the same is marked "Plaintiff's Exhibit No. 12, Plaintiff's Translation of German Patent to Bernados No. 50,909, H. M. H., N. P., Nov. 14, 1918".)

Q. 9. When I asked you to translate the Bernados German patent I also gave you a translation of that patent which I had received from Mr. Church, defendant's counsel, and which I hold in my hand. Please state whether or not you found in that copy furnished by Mr. Church any mistranslations which would change the meaning of the text; and, if so, point out what they were.

A. In line 6, page 1, of the translation furnished by Mr. Church, the words "mixture of carbons and clay" are incorrectly translated.

The German patent states "mixtures of clay *with* carbon". The use of the word "and" is apt to misconstrue the meaning of the whole sentence. Throughout the translation the term "welding tool" is used. There is no corresponding term in the German patent; the word "welding tool" has been used without authority. The German term "Lothkolben" should be translated as "soldering iron".

Page 2, line 13 from the bottom, "heavy" should be "moderate".

There are numerous parts incorrectly translated, but it does not

appear that the wrong translation alters the meaning of the text to an appreciable extent.

Direct examination closed.

No cross-examination.

Deposition closed.

Signature and certificate waived.

NEW YORK, April 7, 1919.

District Court of the United States, Eastern District of Michigan,  
Southern Division. In Equity.

THOMSON SPOT WELDER COMPANY, Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

Harmatta Patent No. 1,046,066.

Depositions taken on behalf of the plaintiff at the office of Messrs. Townsend & Decker, 149 Broadway, New York City, on the seventh day of April, 1919, before George E. Brown, notary public in and for the State of New York.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, Esq., of Counsel for Plaintiff;

MELVILLE CHURCH, Esq., of Counsel for Defendant.

*Deposition of Henry C. Townsend.*

HENRY C. TOWNSEND, having already been sworn in this case, deposes and says in answer to interrogatories propounded to him by Mr. Stackpole as follows:—

Q. 1. Are you the Henry C. Townsend who has already given a deposition in this case on behalf of the defendant?

A. Yes.

Q. 2. In that deposition you have testified that you were counsel for the Thomson Electric Welding Company during the interference of *Rietzel v. Harmatta* in the United States Patent Office in which the Rietzel patent was owned by the Thomson Electric Welding Company.

It appears from the recoad of that interference that Rietzel filed a preliminary statement to which attention was called in your former deposition, and that Harmatta was awarded priority by judgment on the record, because no testimony was taken on behalf of Rietzel.

Please state, if you know, the reasons why no testimony was taken on behalf of Rietzel in the said Harmatta-Rietzel interference.

A. After carefully considering all the facts I concluded that Rietzel could not succeed in that interference and that the final award of priority would be to Harmatta, and a patent would issue to him even if the case were taken up to the Court of Appeals of the District of Columbia, as it should have been if it were desired to get a final judgment.

Q. 3. What were your reasons for believing that Rietzel could not succeed?

A. I thought that what he did so many years previous to Harmatta's filing date would be regarded rather in the light of an abandoned experiment and that Harmatta, having filed an application before Rietzel, would be given the award.

Q. 4. Did you discuss with Mr. Rietzel what he did years before the filing of Harmatta's application?

A. I must have had some talk with him about the facts which he could testify to. Some of them, however, may have come to me through Mr. Tischner.

Direct examination closed.

No cross-examination.

Deposition closed.

HENRY C. TOWNSEND.

Attest: GEORGE C. BROWN,

*Notary Public and Special Examiner.*

*Deposition of Charles F. Tischner.*

CHARLES F. TISCHNER, being duly sworn, deposes and says in answer to interrogatories propounded to him by Mr. Stackpole as follows:—

Q. 1. Are you the Charles F. Tischner who has already given a deposition in behalf of the defendant in this case?

A. I am.

Q. 2. Did you at any time during the pendency of the Rietzel-Harmatta interference go to Europe for the purpose of investigating the ownership of the Harmatta application?

A. I did.

Q. 3. When did you go?

A. I sailed from New York for Bremen, Germany, in the early part of December, 1911.

Q. 4. State what you did, so far as the Harmatta application was concerned, on that trip.

A. When I arrived in Berlin from Bremen I got in communication with Mr. Johann Harmatta, the applicant with whom Rietzel was in interference, and he came to Berlin, and in taking up the matter of his invention with him I learned that a company called the Eisenhutte Silesia Aktien-Gesellschaft controlled all the rights to Harmatta's United States application involved in the interference. I then went to the office of the said company, which for short I will call the Silesia Company, and opened up negotiations to purchase the Harmatta invention and rights for the United States. These negotiations resulted in my purchasing for the Thomson Electric Welding Company the Harmatta invention and the said Harmatta executed an assignment of the invention to the Thomson Company, which assignment was delivered to the Silesia Company to in turn to be delivered over to the Thomson Company when the agreement between the Thomson and Silesia companies was formulated and executed. The terms of the agreement between the said two companies were agreed upon, placed in writing, executed and delivered together with the executed Harmatta assignment.

Q. 5. Please produce copies of the Harmatta assignment and of the contract between the Silesia and the Thomson companies to which you have above referred.

A. I hereby produce a copy of an assignment from Harmatta to the Thomson Electric Welding Company of his United States application Serial No. 183,677, the said assignment being executed in Berlin, Germany, and dated the third day of February, 1912.

I also produce a copy of the agreement between the Eisenhutte Silesia Aktien-Gesellschaft and the Thomson Electric Welding Company, said agreement being dated April 3d, 1912.

(Counsel for plaintiff offers in evidence a Patent Office certified copy of the said assignment, and the same is marked "Plaintiff's Exhibit No. 14, Harmatta Assignment".)

(Plaintiff's counsel also offers in evidence a copy of the agreement between the Eisenhutte Silesia Aktien-Gesellschaft and the

Thomson Electric Welding Company, and the same is marked "Plaintiff's Exhibit No. 15, Copy of Silesia-Thomson Contract".)

(It is agreed between counsel for the respective parties that the copy of said contract may be used with the same force and effect as the original thereof, and the plaintiff agrees to produce the original thereof for the inspection of defendant's counsel on reasonable notice and to have it in court when requested.)

Q. 6. Did you sign the said contract on behalf of the Thomson Company?

A. I did; I had a power of attorney from the Thomson Company authorizing me to conclude an agreement with the owners of the Harmatta invention for the United States, and gave that power of attorney to the Silesia Company as my authority to sign on behalf of the Thomson Electric Welding Company.

Q. 7. What moneys, if any, did you pay to the Silesia Company?

A. I made a payment of \$7,500 to the Silesia Company as the first payment called for under the agreement above referred to.

Direct examination closed.

No cross-examination.

Deposition closed.

C. F. TISCHNER.

Attest: GEORGE C. BROWN,

*Notary Public and Special Examiner.*

District Court of the United States, Eastern District of Michigan,  
Southern Division.

THOMSON SPOT WELDER COMPANY

vs.

FORD MOTOR COMPANY.

*Testimony Taken on Behalf of Plaintiff.*

Met pursuant to notice at the offices of the National Enameling and Stamping Company, Baltimore, Maryland, April 28, 1919, at 11 o'clock A. M.

Appearances: ALAN D. KENYON, Esq., in behalf of the Plaintiff;  
MELVILLE CHURCH, Esq., in behalf of the Defendant.

*Second Deposition of George W. Knapp.*

Thereupon GEORGE W. KNAPP, a witness recalled on behalf of the plaintiff, testified as follows:—

Direct Examination.

By Mr. KENYON.

Q. 1. You are the same George W. Knapp, director general of the National Enameling and Stamping Company, who has testified previously in this case?

A. I am.

Q. 2. In your previous testimony you referred to a trip to Europe in 1904, in connection with Mr. Haberman. Will you kindly state how it was you and he happened to go to Germany on this trip, stating all the facts and circumstances leading up to the trip?

A. Well, about some months before this trip to Europe there was a Mr. Winkler, who was the president of the Silesian Enameling Works, and Mr. Schweisfurt; they came to this country to sell an electric welding patent. They came before our executive board with samples of stuff that was welded, such as pitchers and coffee pots and pans, and upon examining them and giving it due consideration the board thought the proper thing to do was to go to Germany and look into the thing, so Mr. Haberman and myself were deputed as a committee of two to go with power to do whatever we wanted to do in the case.

Q. 3. What kind of electric welding was it?



A. It was spot welding, an invention of a man by the name of Harmatta.

Q. 4. You are familiar with the Harmatta patent?

A. Yes.

Q. 5. And with the spot welding process?

A. Yes. [*Continuing:*] At the appointed time we went to Europe with the intention of looking the thing over. We met Mr. Winkler in Berlin and talked about our connection over there, but he would not let us see anything until we first paid for it and we went down to the Deutsche Bank and telegraphed back to America for \$10,000, which was the asking price. We deposited the \$10,000 and then the following day Mr. Winkler, Mr. Haberman and myself went out to Silesia and we met Mr. Schweisfurt up there and the factory manager and they took us down to the mill and the enamel shop, and showed us the whole thing working. They were riveting on saucepan handles, coffee pot handles and ears and things like that. After seeing this thing I was very much pleased with it. It was really a kind of revelation to see the simplicity with which they were doing those things, putting these things on. We went back to Berlin and we stayed in Silesia a couple of days and then we went back to Berlin and had the agreements drawn up for which we had turned over the \$10,000 and signed the agreements which we had a copy of. Shortly after we returned to America.

Q. 6. Referring to what Winkler and Schweisfurt showed you, and the other members of the executive committee of the National Enameling and Stamping Company, just what did they show you when they were trying to interest you in the invention here in this country before you went abroad?

A. They brought samples of ware that was welded, such as water pitchers and coffee pots and saucepans and stewpans. They had quite a bunch of stuff. I remember that much of it. I tried to get one of them from them, but they would not give any to me. I wanted to take it home to show to everybody else.

Q. 7. What they showed you was ware that had spot welded joints?

A. Yes.

Q. 8. Did they describe the process to you while they were in this country before you went abroad?

A. No; just gave us a general outline, but they would not give us the trick, you know.

Q. 9. Do you mean they would not tell you how the welding was done?

A. No; they showed us the goods. If I had known how it was done I would not have gone to Europe, but would have tried it myself.

Q. 10. Then when you saw this spot welded ware which Winkler and Schweisfurt showed you in 1904 you did not know how the spot welding was done?

A. No; we had never seen anything of that kind before.

Q. 11. And you did not know how to produce such spot welded ware?

A. No; we did not know how to produce it by any of the known methods that we were acquainted with.

Q. 12. How did it strike you when you saw this spot welded ware, as a good thing or not?

A. Struck me as a very good thing.

Q. 13. In your testimony you refer to certain advantages of spot welded ware over rivetted ware. State what those advantages are.

A. The advantages of spot welding over rivetting, you can use a very much lower grade of labor. To rivet, a fellow has to be somewhat of an expert to do fairly good rivetting, while the spot welding is very much easier and the efficiency is very much greater. In the spot welding you save the rivets and often save the perforations in the vessel where the handle or spout or ear was to be attached. As regards the enameling of the article that was welded, with the rivetted ware frequently the enamel would come off of the head of the rivet. The rivets sometimes were made of a different class of steel from what the article was made and the enamel would come off the head or come off the point where it is rivetted down. In that case it makes seconds and has to be sold at a very much lower price.

Q. 14. In a general way, how would the wages of rivetters compare with the wages of those who work on the spot welding machines?

A. The rivetters would get two or three times more wages than the spot welders.

Q. 15. How about the amount of output of finished goods between the rivetting process and the spot welding process?

A. You could weld three or four times more than you could rivet, that is, taking the general run of stuff that is rivetted. Some things are harder to rivet and some things are easier to rivet, but making the comparison between the electric welding and that, I should say three or four times faster with the electric welding.

Q. 16. In the class of goods that are spot welded of the kind that your company put on the market how does your company, the National Enameling and Stamping Company, stand so far as its size or amount of output of such goods compared to other concerns in the same line of business?

A. Well, the National Enameling and Stamping Company comprises five of the largest factories in the United States with a combined capitalization of \$30,000,000. I don't know of any other concern one-half as big or one-quarter as big. I don't know of any other large concern.

Q. 17. It is the largest, then, in its line?

A. Yes, in its line of business in the United States.

Q. 18. How were you making the joints in 1904 at the time Winkler first showed you the spot welded goods? I refer to such goods as your company was then turning out.

A. We were rivetting, also double seaming. Double seaming is locking the sheets together at points, which takes several operations. For instance, like putting a lip on a coffee boiler, we had to double seam them in and it was five or six operations, where the electric welding process it was done with one operation, as it were.

Q. 19. Today, what is the fact? What process do you use in fastening joints on to the vessels that you make?

A. On all black ware for enameling we electric weld, spot weld. Tinware we rivet yet.

Q. 20. Then today on the iron and steel ware you do not use rivetting at all?

A. No, we do not use any rivetting any more on that. The electric welding has entirely superseded that.

Q. 21. When did you and Mr. Haberman return from Europe on this visit in 1904?

A. I have looked at a copy of a letter I wrote to the president

of the National Company which was dated January 3d, 1905, so I must have returned to America before writing this and other letters.

Q. 22. You were back before the date of that report, then?

A. Oh, sure; took me a little time to think all this up.

Q. 23. How soon after your return did you receive the two spot welding machines that you bought in Germany? I merely want your general recollection.

A. I think in about a couple of months.

Q. 24. Did you know how the other factories of the National Enameling and Stamping Company have been supplied with spot welding machines?

A. All the spot welding machines that the National Enameling and Stamping Company uses are made in the Baltimore branch, and we furnish them to them as they wanted them.

Q. 25. From your general recollection, how soon after you received those two machines from Europe did you begin to make machines for the other factories of the National Enameling and Stamping Company?

A. We started immediately upon our return getting our drawings and everything in shape for the wants of the other factories of the National Company.

Q. 26. In your previous testimony you referred to certain advantages on the finished goods. How about the question of seconds when you use the spot welded process as compared with using the rivetted process?

A. We made a few more seconds in the rivetted process than we did with the electric welding process.

#### Cross Examination.

By Mr. CHURCH.

X-Q. 27. In your application of the spot welding process you sometimes make a continuous waterproof seam, don't you?

A. Yes.

X-Q. 28. How early did you begin to do that with your spot welding machine?

A. We did not do that with the spot welding machines. That is a different process.

X-Q. 29. Describe that.

A. That is a roller process; there are two rollers, one underneath and one above, and the sheet passes between the two rolls.

×-Q. 30. And there is contact —

A. All the time with pressure.

×-Q. 31. While the current is going through?

A. Yes, sir.

×-Q. 32. Did you see that process worked in Germany when you were there on your first trip?

A. No; they told me that was a part of another patent when they introduced the side seaming, though I did not see anything of it.

×-Q. 33. Did you have any rights to use that process of welding by means of rollers?

A. No, we had no rights; we just did it.

×-Q. 34. When did you commence to do it in this country?

A. We did that about 1906 or 1907; somewhere about there.

×-Q. 35. And you have done it ever since.

Mr. KENYON. I object to that as not proper cross-examination, as immaterial, irrelevant and incompetent. This objection is made once for all.

A. Yes.

×-Q. 36. When you got these rights from the German company to practice this process of electric welding in this company did you know that they had an application for a patent pending in this country covering that process?

A. Yes.

×-Q. 37. Did they show it to you?

A. They told me if it was issued it was to be a part of the National's property.

×-Q. 38. Did they give you a written license?

A. No; there was not anything to give then.

×-Q. 39. Did they give you a license under the application for the patent that was pending?

A. Spot welding; yes.

×-Q. 40. Was it a written document?

A. Yes.

×-Q. 41. I wish you would produce that if you have it.

A. That was the agreement [*producing paper*].

Mr. CHURCH. You have produced here a copy of an agreement

dated December 3, 1904, between the Silesia Company of the one part and the National Enameling and Stamping Company of the other part. I request that a copy of this paper be offered in evidence by the plaintiff, the original to be produced if required at the trial of the cause.

Mr. KENYON. Counsel for plaintiff has no objection and offers the copy in evidence, the original to be produced if called for. I request that the copy be marked "Plaintiff's Exhibit No. 16, Silesia Agreement with the National Enameling and Stamping Company of December 3d, 1904".

(Copy of agreement having been offered in evidence was marked by the stenographer "Plaintiff's Exhibit No. 16, Silesia Agreement with the National Enameling and Stamping Company December 3d, 1904", and will be found attached to these depositions.)

X-Q. 42. Where was this agreement of December 3d, 1904, executed?

A. In Berlin.

X-Q. 43. And who was your representative there, who took part in the negotiations,—I mean your counsel?

A. He was a correspondent of Samuel Untermyer; I cannot think of his name. I hardly know where to pick that out unless it is on that agreement.

X-Q. 44. I note the name of a witness here on the agreement which appears to be Otto Lubowsky. Was that the name of your representative at this Berlin conference?

A. I could not answer that.

X-Q. 45. I notice in this agreement a reference to the electric welding process by means of which sheets of iron, steel or metal of great thinness are welded together as a substitute for seaming, jointing or any other manner of putting together two or more parts of ware. Was the subject of electric seaming referred to in this very general conference that you had with the German representatives in America and before you went over?

A. No, that was not mentioned in America at all.

X-Q. 46. But it was mentioned further after you got into Germany?

A. Yes, it was in Germany.

X-Q. 47. What was said about it?

A. They said they had another patent which did not pertain to the spot welding that would hereafter be completed and offered for sale, but gave us to understand it was not what we were buying.

×-Q. 48. Who was your American patent counsel at the time this agreement was executed?

A. We did not have any patent counsel. Guggenheim, Untermyer and Marshall were our attorneys.

×-Q. 49. You did not have then any patent counsel?

A. No.

×-Q. 50. Did your attorneys have access to the application for patent that was then pending here in the United States Patent Office on electric spot welding?

A. I cannot say positively. It is likely they had, but it has been so many years ago and those lawyers have moved from one place to another, and whether they kept all the data I cannot say.

×-Q. 51. You don't think it likely you would have entered into the contract in respect of American rights without someone having examined the United States application?

A. Yes, that is right; went through Guggenheim, Untermyer and Marshall's office. They are our retained counsel for anything.

×-Q. 52. When you began to practice this electric seaming process in this country who instructed you how to do it?

A. I invented it myself and I had a couple of machines running in the factory, but in no other factory of the National Company.

×-Q. 53. Did you take a patent on it?

A. No.

Mr. KENYON. Objected to as before.

×-Q. 54. Did you ever apply for a patent on it?

A. No.

×-Q. 55. Did not think it was a patentable invention?

A. I did not think at all about it, you know; some of us manufacturers, when we obtain a thing we give it to the world.

×-Q. 56. That electric seaming process by the use of rollers has been quite extensively used in this factory, has it not?

A. We have two machines running in this factory for a number of years.

×-Q. 57. It is a practical thing then to make a continuous seam



between two pieces of thin metal by the use of rollers applying pressure and the electric current?

A. It is not quite as easy as you would imagine, as the material has to be prepared before seam welding.

×-Q. 58. That is to say, the surfaces have to be very clean?

A. Yes, to make perfect seam.

×-Q. 59. How do you clean them?

A. Pickle them.

×-Q. 60. Are you aware, Mr. Knapp, that the application for patent which was owned by the Silesia Company and pending here in the United States when you made this agreement of December 3d, 1904, showed a mechanism for producing continuous seams as well as a mechanism for producing or welding the sheets at separated spots?

Mr. KENYON. I object to that as not proper cross-examination and wholly immaterial, irrelevant and incompetent.

A. No, it did not. It is an entirely different machine from spot welding.

×-Q. 61. While you were in Germany were you shown a copy of the application or of the patent that had been filed or granted in Germany for the electric welding process of the Silesia Company?

A. No; I don't think they had any patent there.

×-Q. 62. Did they have any patent on it anywhere in any country?

A. I think they had in England; I am not positive of that though.

×-Q. 63. Did they show you the English patent?

A. No.

×-Q. 64. Do you recall whether they had any patent granted in France?

A. No; there was not anything like that referred to.

×-Q. 65. Didn't you think you were paying a large sum of money for the right to use in America an unpatented process?

A. The patent if it had gone to issue would have been worth more than what we paid for it. We took the gambling chance of it going to issue. The shop right was worth considerable to us, so we could go right to work on it with the agreement we had with them.

×-Q. 66. When, at the first interview with the Silesian people

in America in 1904, they showed you specimens of electric welding that had been done by them, was there among those specimens a sample of a continuously welded seam?

A. No; they had not brought that to any state of perfection when I was there.

×-Q. 67. I am speaking about what transpired in America.

A. No; there was not anything said about it at all.

×-Q. 68. Will you please describe with a little more particularity the appearance of the things that were shown you at that time which had been electrically welded?

A. Watering cans with handles were welded at the top and bottom. Kettles with ears were welded to a cylindrical vessel. Handles to dishpans were welded. That is the line of stuff they had carried with them.

×-Q. 69. You have not described as a thing shown you two superposed thin metal plates united by electric welding. Did they show you anything of that sort?

A. No; just the finished article.

×-Q. 70. And in each instance there was something of cast or raw metal or stamped metal welded to a sheet of metal; is that correct?

A. This was all sheet metal they exhibited except the dishpan handles, and they were wire. They were about No. 0 wire; about as big as the handle of that pen.

×-Q. 71. How were they attached, by welding?

A. All handles were flattened on the end by a press and put against the body of the vessel between the electrodes of the welding machine and pressed down.

×-Q. 72. That is the way they were described as having been applied?

A. That is the way it looked. They would not tell us too much.

×-Q. 73. They did not show you at that time?

A. Had no machine in America.

×-Q. 74. They simply described generally how it was done without disclosing a machine?

A. They did not tell us much about that. They set the goods in front of us and let us look at them. They wanted \$30,000 at

first. I never forgot that because I pretty near fell off the stool I was sitting on.

×-Q. 75. You have not told us at how many points any of these articles that were shown you at that time were welded.

A. The watering cans were welded twice at the top and apparently once at the bottom with the handle. The ears of the kettles appeared to be welded. Each ear had two spots on it, one on either side, and the handles of the pans appeared to have one spot on either side of the handle.

×-Q. 76. Did anybody ever attempt to interfere with your use of this electric welding process?

Mr. KENYON. Objected to as immaterial, irrelevant and incompetent and not proper cross-examination.

A. We had been threatened a half a dozen times. They never went very far, though.

×-Q. 77. You were threatened by the Universal Electric Welding Company, were you not?

A. I think that is what it was.

×-Q. 78. Did they ever bring suit against you?

A. Yes.

×-Q. 79. Where was that started?

A. In New York.

×-Q. 80. And they sued you under the so-called Rietzel patent?

A. No; I could not tell what they were suing under because we did not use the Rietzel patent.

×-Q. 81. Were you ever threatened with suit by the Thomson Electric Welding Company?

A. I cannot say positively. We might have been.

×-Q. 82. As a matter of fact, didn't the Thomson Electric Welding Company bring suit against your company?

A. I think they did; I could tell that out of Untermeyer's office.

×-Q. 83. That was brought in New York also, wasn't it?

A. Yes, sir.

×-Q. 84. Isn't it a fact that the Thomson Electric Welding Company and the Universal Electric Welding Company jointly brought a suit against you?

A. That might have been; you are putting too hard questions. All I know is about the patent.

×-Q. 85. Didn't the Universal Electric Welding Company or the Thomson Electric Welding Company, or both of those companies, give your company a license?

A. They offered us the privilege of using all they had if we would give them the privilege of using what we had, and that is all the agreement I know.

×-Q. 86. Was that arrangement carried out?

A. Yes.

×-Q. 87. When?

A. I don't know when that agreement was made.

×-Q. 88. I wish you would look and see and bring the agreement if you have got it.

(Witness here left the room and produced two copies of agreements.)

×-Q. 89. You have produced copies of two agreements, one dated the third day of August, 1912, between Thomson Electric Welding Company and the American Electric Welding Company, and the other dated June 10th, 1914, between the Thomson Electric Welding Company and the American Electric Welding Company. Will you consent that copies of these agreements may be offered in evidence?

A. Yes.

Mr. CHURCH. The defendant offers in evidence the two agreements referred to, the first to be marked "Defendant's Exhibit Agreement of August 3d, 1912, between Thomson Electric Welding Company and American Electric Welding Company", and the other to be marked "Defendant's Exhibit Agreement of June 10th, 1914, between Thomson Electric Welding Company and American Electric Welding Company".

(Copies of agreements referred to were marked by the stenographer in accordance with counsel's request and will be found at the end of these depositions.)

×-Q. 90. Is there any agreement between your company, the National Enameling and Stamping Company, and the Thomson Electric Welding Company and the Universal Electric Welding Company?

A. There was an agreement made; yes.

×-Q. 91. Will you produce a copy of that, please?

A. The agreement of June 10th, 1914, includes all the copies you mention.

×-Q. 92. Did you have anything to do with the negotiations of either of the agreements that has been offered?

A. No.

×-Q. 93. As the result of the adjustment of differences between your company and the Thomson Electric Welding Company and the Universal Electric Welding Company, all the suits that have been brought against your company by these other companies were dismissed, were they not?

A. They were, to the best of my knowledge and belief.

×-Q. 94. Has your company today a specific license or licenses under the Harmatta patent No. 1,046,066, of December 3d, 1912, upon which this suit is brought?

A. Yes.

×-Q. 95. Has the National Enameling and Stamping Company a license under the Harmatta patent in suit from the Thomson Spot Welder Company, the plaintiff in this suit?

A. I cannot answer that; I don't know.

Testimony of witness concluded.

Signature of witness and certificate waived.

*Second Deposition of William A. Herring.*

Thereupon WILLIAM A. HERRING, a witness called on behalf of the plaintiffs, testified as follows:—

Direct Examination

By Mr. KENYON.

Q. 1. You are the same William A. Herring who previously testified in this case?

A. Yes, sir.

Q. 2. In your prior testimony you refer to certain machinery purchased by Mr. Knapp when in Germany, and you were asked to state in a general way the approximate time of the arrival of this machinery here at the factory of the National Enameling and Stamping Company and you answered: "I judge it was about five years ago. I may be mistaken on that; that is only approximately." What can you say as to the correctness of this answer?

A. Well, that is incorrect. I know it to have been longer in

the factory than the date that I testified; as you say, longer than that, and in my judgment it was something around fifteen years from the date of my previous testimony.

Cross-examination waived.

Testimony of witness concluded.

Signature and certificate waived.

*Deposition of George W. Knapp, Jr.*

Thereupon GEORGE W. KNAPP, Jr., a witness called on behalf of the plaintiff, testified as follows: —

Direct Examination.

By Mr. Kenyon.

Q. 1. You are connected with the National Enameling and Stamping Company at their Baltimore factory, are you not?

A. Yes, sir.

Q. 2. In what capacity?

A. As factory manager.

Q. 3. How long have you been connected with the company in the factory?

A. For about nineteen years.

Q. 4. Have you been factory manager all of that time?

A. No, sir; have been factory manager for about seven or eight years.

Q. 5. And before that what was your work here?

A. Well, before that I had charge of the factory office, which looked after purchases, cost and all matters pertaining to the running of the factory.

Q. 6. Has your work been such during all of this time as to make you generally familiar with what is done in the factory and processes and machinery used there?

A. Yes.

Q. 7. You are familiar with the spot welding process used at the factory?

A. Yes.

Q. 8. Do you recall the spot welding machines which your father purchased in Germany?

A. Yes.

Q. 9. About when was that, as far as you can tell from your memory; when were they received here?

A. Let us see; they were received some time in 1905.

Q. 10. What has been the practice of the National Enameling and Stamping Company about the manufacture of other spot welding machines like these two received from Germany; where have they been made?

A. Well, a great many — I won't be positive about all of them — but the most of them have been made at this factory under the supervision of the director general of factories and shipped to the different branches where they would be used.

Q. 11. Did you, in those early days, made and ship any of these spot welding machines to Long Island or Laurel Hill factory of the National Enameling and Stamping Company?

A. Yes.

Q. 12. What date did you ship them?

A. We have shipped at several times and we have shipped as early as April, 1907.

Q. 13. How do you fix that date, April, 1907?

A. I fix the date from a memorandum book that I keep in the office, which book is not used for billing or anything having to do with the office here, but is kept as a matter of reference in case the director general wants to know when certain goods are shipped to certain branches; I could get that information out of this little memorandum book I have kept without going through a great lot of records, and I looked at this book and got the date when we shipped the fifteen machines to New York, or the Berlin factory in New York.

Q. 14. Will you produce the book?

A. Yes.

(Witness here leaves the room and returns with memorandum book which he hands to counsel.)

Q. 15. Will you point out the memorandum in this book that you referred to as the shipment of the machines to the Berlin factory?

A. Here it is [*indicating in book*].

Q. 16. In whose handwriting is this entry?

A. Mine.

Q. 17. In whose handwriting are the various entries in this book both before it and after it?



A. My writing.

Q. 18. Did you make this entry about the shipment to the Berlin factory of April 27th, 1907?

A. I made that on April 27th, 1907.

Q. 19. Are you able to state positively after refreshing your recollection from this entry that you made this entry on that date?

A. Yes.

Q. 20. Are you able to state that these fifteen machines referred to in it were shipped to the Berlin factory on that date or about that date?

A. They were shipped about that date. I won't be positive it was that date, but it was within a few days of it.

Q. 21. What were these machines that is referred to in this entry?

A. Fifteen machines in all, thirteen of what we call vertical machines,— the ones that go straight up and down,— and the two rotary machines were the ones that worked over sideways.

Q. 22. What kind of electric welding machines were they?

A. They were all spot welding machines.

Q. 23. And the vertical type was like one of the machines received from Germany?

A. Each one was like the machines we received from Germany. We coined those words ourselves to designate the different types.

Q. 24. And the thirteen vertical machines, how did they compare with the vertical machines you received from Germany?

A. They were the same.

Q. 25. And the two rotary ones were like the rotary one received from Germany?

A. Yes.

(By consent, it is stipulated that the entry may be entered upon the record.)

Q. 26. "April 7th — *Berlin.*

" Electric welding machines.

" Thirteen vertical.

" Two rotary at \$300 each \$4500."

Q. 26a. What does "Berlin" refer to in this entry?

A. That is the way we designated our Long Island factory.

Q. 27. Where is that factory located on Long Island?

A. We have sometimes called it Laurel Hill factory, but at the present time they call it Maspeth Post Office.

Q. 28. Why was this factory called the Berlin factory?

A. Because the factory was located at a place known as Berlin village.

Q. 29. Is that the factory that Mr. Richman has charge of?

A. Yes.

Q. 30. Was this the first shipment of these spot welding machines made to this factory or to any other factory of the National Enameling and Stamping Company, or were there earlier shipments.

A. There was one shipment made about April 15th, 1907, to the Granite City factory, of Granite City, Illinois.

Q. 31. Does an entry of that appear in this same memorandum book in your handwriting under that date?

A. Yes.

Mr. KENYON. The book is offered to counsel for defendant for his examination.

Cross Examination.

By Mr. CHURCH.

X-Q. 32. Your father in his examination today has referred to certain electric welding machines for welding continuous seams that have been used in this factory since 1906 or 1907, I think he said. To what particular uses have those machines been put? I mean describe the kinds that have been welded together by means of them.

Mr. KENYON. I object to that as not proper cross-examination, as wholly immaterial, irrelevant and incompetent and improper.

A. As far as I know, those machines were used for welding side seams of articles.

X-Q. 33. What articles?

A. I should say pots or kettles.

X-Q. 34. How about spouts on coffee pots and things of that sort?

A. Well, we don't put spouts on coffee pots. We put lips on coffee pots and spouts on tea pots. The lips of coffee pots can be welded by the seam process.

X-Q. 35. In this seam you employ rollers constituting the electrodes, do you not?

## Evidence for Plaintiff.

A. In some instances they are rollers.

×-Q. 36. And the rollers where used are employed for applying both pressure and current, are they not?

A. As far as I know.

×-Q. 37. You are in charge of this factory and you ought to know. You do know, don't you?

A. That is the purpose, as far as I know, it is used for.

×-Q. 38. There is nothing, then, impracticable about the use of rollers for electrically welding continuous seams is there?

Mr. KENYON. I object to this line of testimony as not proper cross-examination, as wholly immaterial, irrelevant and incompetent.

A. I should not think so.

Testimony of witness concluded.

Signature and certificate waived.

District Court of the United States, Eastern District of Michigan,  
Southern Division. In Equity.

THOMSON SPOT WELDER COMPANY, Plaintiff,  
Against

FORD MOTOR COMPANY, Defendant.

Harmatta Patent No. 1,046,066.

Depositions taken on behalf of the plaintiff, pursuant to notice, at Laurel Hill, Long Island, New York, before Edwin Seger, a notary public in and for Queens County, at the office of the National Enameling & Stamping Company, on Monday, May 5, 1919, at 10.30 A. M.

Present: ALAN D. KENYON, Esq., Counsel for Plaintiff;  
MELVILLE CHURCH, Esq., Counsel for Defendant.

*Deposition of Charles H. Schwing.*

CHARLES H. SCHWING, a witness called on behalf of plaintiff, having been duly sworn, testifies as follows:—

Direct Examination.

By Mr. KENYON.

Q. 1. What is your name, age, and residence?

A. Charles H. Schwing; thirty-six years of age; 58 95th Street, Woodhaven, Long Island.

Q. 2. And your occupation?

A. Is general bookkeeper.

Q. 3. For whom?

A. For the National Enameling & Stamping Company.

Q. 4. At what office?

A. At the New York office, 413 Fifth Avenue.

Q. 5. Testimony has been given in this case that the Baltimore branch of your company shipped fifteen spot welding machines to the Berlin branch or Long Island branch of the company. Have you any records in your books of the sending of any machinery by the Baltimore branch to the Long Island branch along in April or May, 1907?

A. I have; by the records of the expenditure book.

Q. 6. Will you point out the item that you refer to in the expenditure book?

A. [*Witness indicating.*] In the month of April the entry shows here "Baltimore Purchase Account of Machinery, Tools & Fixtures", credited to the Baltimore branch, and charged to our "Improvements & Additions Account, Analysis Book", showing that it called for machinery.

Q. 7. You have referred to another book as the analysis book. What book is that?

A. It is simply to analyze the expenses of the expenditure book.

Q. 8. Those two books are the books now before us, are they?

A. They are the same.

Q. 9. In whose handwriting are they?

A. They are in my own handwriting.

Q. 10. Will you please read upon the record the complete entry that you have referred to in the expenditure book, and also the complete record in the analysis book?

A. "New York Branch (Comprising Berlin Factory and New York Store) Expenditure Book." The entry reads: "April 31st — Voucher No. 1686 — Baltimore Purchase A/C." Particulars: "M. T. & F.", meaning "Machinery Tools & Fixtures". The posting, folio is "No. 159". The local account of the credit ledger was credited with \$4,500, and it was charged to our "Improvements &

Addition Account" of \$4,500. Accounts debited, "Improvements & Additions", under Berlin, "\$4500."

The analysis book is headed: "New York Branch — Analysis of Expenditures." It is simply dated as "April 1907". Name of factory: "Baltimore." "No. 1686." In the total column is "\$4500", and then the "Analysis of Improvements & Additions" under the "Analysis of Machinery, Tools & Fixtures" is "\$4500."

Q. 11. What is the heading of the year at the top of the page in the expenditure book?

A. The date of 1907, in the month of April.

Q. 12. All the items on that page are of April, 1907?

A. All of April, 1907.

Q. 13. And in the analysis book?

A. In the analysis book also April, 1907.

Q. 14. In the analysis book, in the column headed "Name of Factory", appears a capital B at the top of the column. What does that mean?

A. Baltimore.

Q. 15. The entry in this analysis book of the \$4,500 in the column under "Improvements & Additions" of "Machinery, Tools & Fixtures", indicates what?

A. Indicates that the entry of \$4,500 applied to machinery, tools or fixtures, and not to any of the other analyses as stated in the improvements and additions account.

Q. 16. Does that mean machinery, tools and fixtures sent by the Baltimore plant to the Long Island plant?

A. It means that the entry in the expenditure book, which is the one that is approved by the auditors, shows that it came from Baltimore purchase account — at least was credited to Baltimore — that is, came from the Baltimore branch.

Q. 17. In the expenditure book, in the heading you have referred to, appears the word "Berlin". What does this mean?

A. That means the Berlin — what we term the Berlin — factory, or this Laurel Hill plant here.

Q. 18. This plant we are in today on Long Island?

A. Yes; that is called the Berlin plant.

Q. 19. Now, of your own knowledge, do you know what this

machinery consisted of for which a charge of \$4,500 was made on April 31st?

A. No, sir, I do not.

Q. 20. Mr. Knapp has testified that fifteen spot welding machines were shipped from the Baltimore factory, or were ordered shipped, in April, 1907. Have you any receipt or invoice at the New York office showing the receipt of those goods here at this factory?

Mr. CHURCH. Objected to as calling for secondary evidence.

A. No, I have not, outside of the fact that the entry is made in the books here, showing that the machines were received here.

Q. 21. In the regular practice in those days, was an invoice or receipt sent for these goods?

A. Yes, an invoice would be sent from the branch and would come to our branch first. All mail is addressed to the New York general office. It is then registered and distributed to the plant at Berlin for approval. When the goods come in and are passed upon by those in charge, the invoice is returned to be entered into the controlling accounts at the New York office, because all the finances are handled from there.

Q. 22. Have you looked to see whether you could find such an invoice or receipt?

A. Yes, I made two separate investigations. We haven't got it in New York, and I came over here myself and looked through our plant and buildings here to find invoices or whatever information I could, but this was all we could come across.

Q. 23. You weren't able to find the invoice or receipt?

A. No; it is too far back for a small paper.

Q. 24. You looked in all the places where it was likely to be?

A. In all the places where it was likely to be. There were only three places where it would be likely to be kept, and I spent my time trying to find it there.

Q. 25. Does this entry here in the two books you have referred to under April, 1907, necessarily mean that the machinery was received here at the Long Island factory in April?

A. No, it does not.

Q. 26. Will you explain about that?

A. In almost any kind of a case, and particularly mentioning

this one here, an invoice would be billed out, we will say, from our Baltimore plant. It would come here without question the following day. (It takes that about for the length of the mail.) It takes a day for it to come from the New York office over here. (We only use two boys a day in carrying mail back and forward.) An invoice is kept here for a period of several days,— maybe five or ten days,— until the goods arrive. The invoice being passed upon, it is sent back to the New York store to be entered up. We have made it a practice to try to get all the invoices pertaining to one month in the month to which it belongs. It does not mean to say, because it is dated April 31st, that we waited until the last day of April. This entry may not have been made until the tenth or fifteenth day of the month.

Q. 27. What month?

A. The month of May,— the following month.

Q. 28. So that the goods may have been received in May and yet they would appear in this book as charged under April?

A. Absolutely.

Q. 29. That was because of the date of the invoice, I presume?

A. We try to keep all the plants to balance with each other during the month.

Q. 30. Do you keep your books open indefinitely in case a shipment is delayed?

A. We are very apt to keep them open a day or two longer, if it is very important, in order to get our expenses in for the month.

Q. 31. Would you keep them open all through the month of May?

A. No, absolutely.

Q. 32. So, judging from your entries, it must have been received during the month of May?

A. I would say before the 15th anyway; I don't know of an instance where they kept it longer than the 10th or 12th before the books were closed.

Direct examination closed.

Deposition closed.



*Deposition of Charles J. Timms.*

CHARLES J. TIMMS, a witness called on behalf of plaintiff, having been duly sworn, testifies as follows: —

Direct Examination.

By Mr. KENYON.

Q. 1. What is your name; age; and residence?

A. Charles J. Timms; age, fifty-two; 731 Hancock Street, Brooklyn.

Q. 2. And what is your occupation?

A. General clerk and in charge of receiving at the Laurel Hill branch of the National Enameling & Stamping Company.

Q. 3. How long have you occupied that position?

A. About twenty-four years.

Q. 4. What kind of work is included under your supervision?

A. To check the invoices for any goods that we purchase; to check them and to pass them to Mr. Richman, who pays them on my checking.

Q. 5. Do you mean that you take an invoice for goods and check it up to see that the goods have actually been received, and then turn it over to Mr. Richman?

A. Yes, then turn it over to Mr. Richman.

Q. 6. Do you recall the receipt at the factory here of fifteen spot welding machines sent by the Baltimore factory?

A. I do.

Q. 7. From your general recollection, how long ago was that?

A. I should say from ten to twelve years ago approximately.

Q. 8. Did you have any particular occasion to remember this particular shipment?

A. Yes, sir; this was a new machine that we had never had in the plant before, and the quantity of fifteen pieces coming in at one time impressed itself very plainly upon my memory.

Q. 9. So that you have a distinct recollection, independent of any records, of the receipt of these goods ten or twelve years ago?

A. Positively.

Q. 10. I call your attention to entries in the expenditure and analysis books that Mr. Schwing has testified to. You were present during the taking of this testimony, were you not?

A. Yes, sir.

Q. 11. Now, referring to those, while you did not make them, can you tell what class of machinery or kind of machinery is referred to, and is there any way or indication that would help you?

A. Only from a general knowledge of the amount of money,—of the \$4,500,—fifteen machines at \$300, charged to improvements and additions. Mr. Schwing would have put it under the heading that we would mark for it; if it was improvements and additions, he would have put it under that classification; he would have to mark it under the exact classification that we have, and the exact amount of \$4,500.

Q. 12. What kind of machines do these two entries refer to, as far as you can tell?

A. To welding machines.

Q. 13. Spot welding machines?

A. Spot welding machines; yes.

Q. 14. The first batch you received at the factory?

A. Yes.

Q. 15. These two books show the date as in April, 1907. Does that concur with your general recollection as about the time that those goods were received here?

Mr. CHURCH. Objected to as leading.

A. I should say about the early part of May the goods were received.

Q. 16. What year?

A. 1907.

Q. 17. Do you know what charge was made for each of these machines?

A. Some at \$300.

Q. 18. That was the customary price for spot welding machines?

A. That was something new and impressed itself so upon my mind at the time.

Q. 19. You have charge of the invoices and receipts at the factory here on Long Island, I take it from your testimony; is that so?

A. Yes, sir; and we send them over to New York.

Q. 20. And before you send them you check them up to see if the goods have been received?

A. If the goods have been received and O. K.

Q. 21. Have you looked for any invoice or receipt of these fifteen spot welding machines that were received from Baltimore in the spring of 1907?

A. Yes, sir; we made a thorough search, but on account of length of time we are unable to find it.

Q. 22. Have you looked everywhere that it would be likely to be?

A. Yes, sir, everywhere that it would be likely to be.

Direct examination closed.

Cross Examination.

By Mr. CHURCH.

×-Q. 23. You remember distinctly the receipt of these fifteen spot welding machines, I understand?

A. Yes, sir.

×-Q. 24. And they made an impression upon you because they were the first of the kind you had ever seen?

A. Yes, sir.

×-Q. 25. Describe one of them.

A. A machine in place of the ordinary way of taking a hammer and rivetting what they call "rivets" on to a handle with the hammer by hand. This does the work automatically on a machine. They simply put the handle in place on the article to be rivetted and the machine comes down and welds it on itself without the use of any rivets.

×-Q. 26. Is that the best description you can give of one of those machines?

A. Well, it is,—I don't quite get your meaning. It is a long iron machine.

×-Q. 27. Suppose you explain it a little more particularly. I want to see how good your recollection is of the construction of that machine. Do your best.

A. It is pretty hard to explain a thing like that. You take a handle of an article to be rivetted on a machine and place the article to be rivetted under this, and bringing the machine down—the top of the machine down—that welds the handle of the article on to the article to be rivetted, in place of doing it by hand. It is a long upright,—quite a large upright machine.

X-Q. 28. You say you brought down the machine. What part of the machine struck the handle?

A. The top part of the machine would certainly strike the handle.

X-Q. 29. What was the nature of that?

A. I couldn't tell you the technical term. I am not a machinist; I am simply a general clerk in charge of receiving. I simply know the general operations; I don't know the technical terms.

X-Q. 30. The truth is you could not describe the construction and mode of operation in detail?

A. Not technically, because I am not a machinist.

Cross-examination closed.

Redirect Examination.

By Mr. KENYON.

RDQ. 31. You have seen these machines in operation?

A. Certainly.

RDQ. 32. Tell what the man does in spot welding a lip on to a vessel like a teapot or a coffee pot; tell just what the man does, the various operations he goes through.

A. One of the operations is putting the handle on to a bowl,—take a saucepan bowl,—it is one part, and then take the handle, which is another part. By putting the two articles in the machine and bringing the machine down that makes one article out of the two parts, the handle and the bowl.

RDQ. 33. What does the workman do to bring the machine down?

A. Presses his foot down; that causes the electricity to go through the machine.

RDQ. 34. What is the shape of the part of the machine that is brought down? What does it look like?

A. Well, I should imagine something of a block,—I should call it block form. I would not answer those questions; I am not technical enough for that purpose.

RDQ. 35. The part that strikes the lip that is being fastened to the basin, what is the shape of that; just the part that strikes the lip?

A. I should call it concave,—I wouldn't know what to call it. You see my business is simply the receiving end of the department. I know what the thing is for and for what it is used.

*RDQ. 36.* You know when you see a spot welding machine?

*A.* I know when I see a spot welding machine; yes, sir.

Redirect examination closed.

Recross Examination.

By Mr. CHURCH.

*R×-Q. 37.* When these fifteen machines were received, were they all put in the same room?

*A.* Yes, sir.

*R×-Q. 38.* That room was open to the public, was it not?

*A.* No, sir; that is in our engine room.

*R×-Q. 39.* Were special arrangements made to guard that from the view of the public, that room containing those spot welding machines?

*A.* Only those who have business there would go into that department.

*R×-Q. 40.* Well, you didn't try to keep the use of those machines a secret, did you?

*A.* I know they were put into the room; that is all that I know, and that they were kept in a part that nobody would go into unless they had business there.

*R×-Q. 41.* Were those spot welding machines all alike?

*A.* To the best of my knowledge, I should say yes, they looked to me to be the same.

*R×-Q. 42.* Your recollection does not enable you to recall any difference between them; they looked all alike to you?

*A.* There were fifteen machines received; fifteen welding machines.

*R×-Q. 43.* And, now, do you rely upon what you find in the book upon that subject, or upon your memory?

*A.* Partly from the books, a great deal from memory; they were something entirely new, so it impressed me when they came in.

Recross-examination closed.

Deposition closed.

*Deposition of William B. Heron.*

WILLIAM B. HERON, a witness called on behalf of plaintiff, having been duly sworn, testifies as follows:—

## Direct Examination.

By Mr. KENYON.

Q. 1. What is your name, age and residence?

A. William B. Heron; fifty-four years old; 149 Harmon Street, Brooklyn.

Q. 2. What is your occupation?

A. Electrician.

Q. 3. For what concern?

A. National Enameling & Stamping Company.

Q. 4. At what factory of theirs?

A. Berlin, Laurel Hill.

Q. 5. And how long have you been electrician at their factory at Berlin?

A. Since 1903, except fourteen months interval in 1904 and 1905.

Q. 6. Except for that interval you have been working continuously as electrician at this factory ever since the date you name?

A. Yes.

Q. 7. Do you recall the receipt at the factory of fifteen spot welding machines from the Baltimore factory?

A. Yes, sir.

Q. 8. From your general recollection, about how long ago was that?

A. Twelve years ago,— 1907.

Q. 9. Have you any way in which you can fix the date absolutely?

A. Nothing but the record of the time I have kept on the job.

Q. 10. What record is that?

A. The record of the work and time I have been working; the time I put in.

Q. 11. Will you produce that record?

A. [Witness produces book.]

Q. 12. Will you please state just what this book is?

A. It is a record of the time the men put in on the job for setting up the generators to operate the machines.

Q. 13. You mean for these fifteen spot welding machines?

A. Yes, for these fifteen spot welding machines.

Q. 14. Whose book was it?

A. It was a throw-away book. I claimed it for my own after I picked it up from a lot of scraps.

Q. 15. Will you please point out the entries you refer to in this book?

A. The entries for the amount of time for installing the cables to carry the current to operate the machines.

Q. 16. Is this the page you have referred to?

A. All through here [*witness referring to the first few pages*].

Q. 17. In whose handwriting are the entries on these first few pages?

A. My own.

Q. 18. And were made by you?

A. And were made by me.

Q. 19. When were they made?

A. At the time the job was being put through.

Q. 20. Are there any dates on these pages?

A. They are all dated.

Q. 21. What are those dates?

A. Starting May 18, 1907, into June, end of July and into August.

Q. 22. The last date was what?

A. August 5th.

Q. 23. The heading of this is: "G. E. Co. A. C. Gen." What does that refer to?

A. That refers to the generator we used for producing the current to operate the spot welders with,—the only machine we have of its kind.

Q. 24. What did you have to do with these fifteen spot welding machines?

A. Just set them up and got them in proper operation.

Q. 25. You had charge of that work, did you?

A. Yes, I did.

Q. 26. Do I understand that the various men mentioned on these pages worked under you on that work?

A. Yes, worked under me on that work.



Q. 27. How long did it take to set up those fifteen spot welding machines?

A. That I couldn't say; that is, before we started to operate any of them; I couldn't say what date that started in. We started in different parts of the factory.

Q. 28. Well, you can tell when the last work was done setting up those machines, can't you,—the date of the last work,—from this book?

A. Well, we ceased operations in putting up,—yes, that book would probably cover it. We were operating before the end of that work.

Q. 29. You mean that some machines had been fully installed and were operating before August, 1907?

A. Yes, sir.

Q. 30. But the last of them were set up by August, 1907?

A. Yes.

Q. 31. What was done with these fifteen spot welding machines after they were set up?

A. Manufacturing the goods.

Q. 32. You mean fastening joints on to ware by spot welding?

A. Putting the trimmings on by spot welding.

Q. 33. From the entries in these books, can you state positively that it was at least by May, 1907, that those fifteen spot welding machines were at the factory here at Berlin?

A. Yes, at the factory here at Berlin.

Q. 34. Was it any part of your business to operate any of these spot welding machines?

A. No, sir.

Direct examination closed.

Cross Examination.

By Mr. CHURCH.

X-Q. 35. There is no entry in this book of yours that refers in terms to spot welding machines, is there?

A. Not directly; no, I don't believe there is.

X-Q. 36. And you had nothing to do with the operation of those machines?

A. No more than to see they were in proper working order for

operating in the production line, — just in testing out and inspections.

×-Q. 37. Were all these machines put up in one room.

A. No, sir.

×-Q. 38. Where were they placed?

A. In three or four different places.

×-Q. 39. Were all these machines alike?

A. They were all alike, except there were two rotaries and thirteen straight action machines. We called them rotary; it is only a side sweep, side offset, on two of them.

×-Q. 40. I would like to have you describe a little more particularly the difference between those two sorts of machines.

A. The thirteen made contact in a straight perpendicular manner. The others set off more in this way — one was a straight perpendicular action; one was a lateral action, — two of them.

×-Q. 41. Were these machines where anybody coming into the factory could see them in operation?

A. I should say they were; yes.

×-Q. 42. No special injunction of secrecy about their use?

A. No, not that I know of.

Cross-examination closed.

Mr. KENYON. Plaintiff's counsel offers in evidence the book referred to by the witness, and it is marked "Plaintiff's Exhibit No. 17, Heron Memorandum Book".

Deposition closed.

*Deposition of Sol Richman.*

SOL RICHMAN, a witness called on behalf of plaintiff, having been duly sworn, testifies as follows: —

Direct Examination.

By Mr. KENYON.

Q. 1. What is your name, age, and residence?

A. Sol Richman; reside at 35 Greenwood Avenue, Far Rockaway, Long Island; fifty-two years old.

Q. 2. And your occupation?

A. Factory manager.

Q. 3. Of what factory?

A. Laurel Hill factory, New York branch, National Enameling & Stamping Company.

Q. 4. How long have you been manager of that factory?

A. For twenty years for the National Enameling & Stamping Company; and prior to that factory manager for the Haberman Manufacturing Company.

Q. 5. And all the time at this same factory?

A. Yes, sir.

Q. 6. Where is the factory located?

A. Laurel Hill, Long Island.

Q. 7. Did it ever have a different name?

A. This town is termed Berlin Village, and we called the factory the Berlin factory of the National Enameling & Stamping Company.

Q. 8. That was the old name, I understand?

A. Yes, sir.

Q. 9. Are you familiar with spot welding machines?

A. Yes, sir.

Q. 10. Do you use them at your factory?

A. Yes, sir.

Q. 11. How long have you used them?

A. To the best of my recollection, since 1907.

Q. 12. Have you any way of fixing that date?

A. Only that I ordered fifteen machines from Mr. Knapp, who went to Europe; I ordered fifteen machines of Mr. Knapp in 1906, but I have no copy of the records; all our records have been destroyed, and according to our books they came in in April or May, 1907.

Q. 13. And does that agree with your general recollection as to the length of the time since these machines were received?

A. Yes, sir.

Q. 14. Who supplied these machines to your factory?

A. National Enameling & Stamping Company, Baltimore branch.

Q. 15. Do you recall the first shipment of those machines?

A. The fifteen all came in one car.

Q. 16. What was done with these machines?

A. When they arrived at the plant, I ordered them to be put in the engine room until such time as we were ready with the installation for operation.

Q. 17. When were they installed, as near as you can recollect?

A. During the month of May or June, in 1907.

Q. 18. Who did this work?

A. Our electrician, Heron.

Q. 19. How soon is it your recollection that one or more of these machines were put at work in the regular way of production in your factory after your receipt?

A. I should judge that we did electric welding in the month of June or July, 1907.

Q. 20. So it was at least within several months after the receipt of the machines?

Mr. CHURCH. Objected to as leading.

A. One or two months after they were received; but they were not all put in operation at one time.

Q. 21. How soon would you say that all these machines had been put into operation?

A. I should judge by the end of the year 1907 they were all pretty well under way.

Q. 22. How extensively have these machines and others like them been used for spot welding in your factory since then?

A. I suppose we have thirty or thirty-five working at the present time.

Q. 23. They have been used continuously right along since 1907?

A. Pretty much; whenever we have work.

Q. 24. What class of work do you do on spot welding machines?

A. A general line of cooking utensils, such as dishpans, saucepans, coffee pots.

Q. 25. And what part of the work on those dishpans, saucepans, etc.?

A. Affixing the various handles, lips or spouts.

Q. 26. Before you received these fifteen machines, how were those spouts and handles put on to the ware?

A. By means of rivetting.

Q. 27. How is it today in your factory; do you put such spouts and lugs on the goods by spot welding, by rivetting, or by both?

A. Both; but the majority is being done by electric welding,—spot welding. Of course, very heavy work we do with rivets.

Q. 28. What kind of work do you use rivets with? What metal?

A. When it comes to 16 or 18 gauge materials and very heavy handles such as used for hotel ware, our machines are not heavy enough to carry the current through those heavy materials.

Q. 29. What metal is that ware made of?

A. To what do you refer?

Q. 30. This heavy metal.

A. From 18 to 14 gauge.

Q. 31. What kind of metal?

A. Sheet steel, and the handles are made from wrought iron, say one-quarter to three-eighths inches in diameter.

Q. 32. Do you use the rivetting with lighter work at all?

A. On tinware.

Q. 33. On tinware only?

A. That's all.

Q. 34. All the rest is done by spot welding?

A. All the ware for enameling is spot welded.

Q. 35. How does spot welding compare with rivetting in the class of work that you use spot welding for in your factory,—that is to say, lighter work?

A. As to quality?

Q. 36. In every way, cost, merit and excellence of the goods. In other words, how do these two methods compare with one another in practical use?

A. In my judgment, welding is from 100 to 150 per cent faster than rivetting; and, as to quality, welding is far superior to rivetting, especially in the enameling process. We have no rivet heads to contend with when we spot weld. In former years, when we used rivets, when we fired the article the rivets became loose and the enamel got between the article and the handles. By spot welding we don't have any such troubles. It makes the two metals homogeneous, whereas the other way, when you put an article into the fire for scaling, the handles become loose, because the material deteriorates and scale forms and it becomes loose, and we get considerably more seconds with an article that is rivetted than we do by spot welding; and an article that is spot welded is perfectly smooth on the inside, whereas when we use rivets the enamel shows the head of the rivets on the inside and the enamel is very apt to

chip off by the constant use of the handle, and naturally the rivets will work loose.

Q. 37. How do spot welding and rivetting compare with each other in cost?

A. I should think you can do two to one spot welding against rivetting. Of course, in some articles, the heavier articles, there may be only 100 per cent,—it depends on the nature of the work,—but in general I think it is 100 per cent.

Q. 38. How about wages of rivetters as compared with wages of workmen on spot welding machines?

A. You refer to the present time, or former times?

Q. 39. In the present time and ten years or so ago.

A. Those days are gone by. When we first installed these machines I suppose we got boys and girls for \$5 and \$6 a week, where we paid rivetters \$12 a week; but today the same boys on these machines get \$18 to \$20 a week and rivetters from \$30 to \$40 a week, and they are not satisfactory.

Direct examination closed.

Cross Examination.

By Mr. CHURCH.

x-Q. 40. During all this period that your company has been using spot welders, what efforts have been made to stop their use by patent suits?

A. None whatever.

x-Q. 41. Don't you know that a suit was brought by the Thomson Electric Welding Company and the Universal Electric Welding Company against your company for infringement?

Mr. KENYON. Objected to as not proper cross-examination.

A. I never was informed of any suit.

x-Q. 42. Never heard of it?

A. No; I was never informed to stop.

x-Q. 43. But you were informed of the fact that a suit had been brought, were you not?

A. I was never informed that our company was sued for infringement.

Cross-examination closed.

Deposition closed.

Signatures and certificate waived.

District Court of the United States, Eastern District of Michigan,  
Southern Division. In Equity.

THOMSON SPOT WELDER COMPANY

v.

FORD MOTOR COMPANY.

BOSTON, MASS., May 6, 1919, 10 A. M., 84 State Street.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, Esq., of Counsel for Plaintiff;

MELVILLE CHURCH, Esq., of Counsel for Defendant.

*Deposition of Robert W. Clark.*

ROBERT W. CLARK, a witness called by and on behalf of plaintiff,  
having been duly sworn, deposes and says:—

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation.

A. Name, Robert W. Clark; residence, 69 Whiting Street, Lynn,  
Mass.; age, forty-nine years; occupation, employed by the Thom-  
son Electric Welding Company.

Q. 2. In what capacity are you employed by the Thomson Com-  
pany?

A. At the present time as foreman and demonstrator.

Q. 3. When were you first employed by the Thomson Electric  
Welding Company?

A. In the winter of 1891 or 1892.

Q. 4. In what capacity?

A. At that time I was stock keeper and shipping clerk.

Q. 5. Have you been employed by the Thomson Company ever  
since?

A. With the exception of two years. From 1894 to '95 I was  
operating one of their welding machines for another company.

Q. 6. What have been your positions with the Thomson Com-  
pany from the beginning of your employment?

A. From 1891 to 1893 I was stock keeper and shipping clerk;  
1894 I was operating a welder in the factory; from 1894 to 1895 I  
was away from the company; from 1896 to 1907 I was operator on  
electric welders at the factory; from 1907 to about the present



time I have been foreman, and the last year or so demonstrator and so-called service man.

Q. 7. During the years that you were with the Thomson Company, were you employed at their factory in Lynn, Mass.?

A. Yes, sir.

Q. 8. Did they have any other factory but that one?

A. That is the only one.

Q. 9. Were you familiar with the types of electric welding machines made by the Thomson Company during your employment?

A. Yes, sir.

Q. 10. Do you know Adolph F. Rietzel?

A. Yes, sir, I do.

Q. 11. How long have you known him?

A. Ever since the first period of my being employed by the company.

Q. 12. Was he employed by the Thomson Company at that time when you entered their employ?

A. He was.

Q. 13. In what capacity?

A. He was foreman at that time.

Q. 14. Mr. Rietzel has been called as a witness for the defendant in this case. Have you read his deposition?

A. I have.

Q. 15. Mr. Rietzel in his deposition states that in the year 1898 at the factory of the Thomson Company in Lynn, Mass., he electrically welded together the ends of hub bands for wagon wheels by lapping the ends of the hub bands and then electrically welding the overlapped ends. He also states that he thinks that he showed you his work on these bands. State what you recall concerning this matter.

A. I do not remember anything about it.

Q. 16. Do you recall the electric welding of the ends of hub bands by Mr. Rietzel in or about the year 1898?

A. Yes, the butt welding of bands about that time.

Q. 17. Do you recall his welding hub bands by overlapping their ends?

A. No.

Q. 18. Mr. Rietzel in his deposition speaks of using an electrode

with a hole in its end for this purpose. Do you recall the use of such an electrode?

A. I do.

Q. 19. What was it used for?

A. I used that for welding a sewing machine part.

Q. 20. What kind of a sewing machine part?

A. It was a small metal plate having an arm extended from one end and a small disc or washer with a pin through the centre and was welded to the other end of the plate; the hole in the electrode was made to take the centre pin so that the two could be welded together.

Q. 21. Do you recall any use by Mr. Rietzel of this electrode for welding overlapped ends of hub bands?

A. I do not.

Q. 22. Mr. Rietzel has also testified that he did some electric welding on pieces of plough shares later in the same year 1898; do you recall any work along those lines?

A. I do not.

Q. 23. Do you recall doing any work yourself on such pieces of plough shares in or about that time?

A. I have a recollection of someone bringing in several pieces on which they asked me to weld the several pieces together. I tried this out by using two copper dies which covered the entire ends of the pieces to be welded; in fact, I didn't obtain any welds at all, but these might pertain to plough shares.

Q. 24. When you say that the copper blocks covered the ends of the pieces, what do you mean exactly?

A. The pieces as I recall them were narrow strips, possibly four or five inches long and I should judge one and one-half inches wide. His idea was to weld the ends together for about an inch I should judge.

Q. 25. Did you know Mr. Charles Osgood?

A. I did.

Q. 26. Is he alive now?

A. He is not; he died some three months ago.

Q. 27. Was he employed by the Thomson Electric Welding Company at Lynn?

A. He was.

Q. 28. What was his condition so far as his mental faculties were concerned previous to his death?

A. For the past three years he was in very poor health, had one or two slight apoplexy strokes and his mental faculties were poor, especially his memory. He was employed only in a minor position.

Q. 29. It appears that in or about the year 1888, Prof. Elihu Thomson invented a method of electric rivetting and took out a patent therefor in 1889, No. 396,015, drawings of which I show you. When you entered the employ of the Thomson Electric Welding Company, was that company making machines for such electric rivetting?

A. No, sir; not that I know of.

Q. 30. During the next twenty years did the Thomson Company make any such machines for electric rivetting?

A. No, sir.

Q. 31. Except for the two years that you were away from the plant at Lynn, would you have known of such machines had the Thomson Company made them?

A. I should.

Q. 32. In or about 1890, Prof. Elihu Thomson appears to have invented a method of electric welding for welding the overlapped edges of two sheets of metal between two roller electrodes and on January 20, 1891, took out patent No. 444,928, a copy of which I show you. At the time you entered the employ of the Thomson Company was that company making machines for such roller welding?

A. No, sir.

Q. 33. During the next twenty years was the Thomson Company making such machines?

A. Not with the two roller electrodes.

Q. 34. What difficulties, if any, are there in the use of such roller electrode welding machines?

A. The difficulty found in what is called lap seam welding has been that the stock is sometimes scaly and the edges are rough, somewhat rusty, and in setting the pieces to be welded the overlapped portion must be very accurate. The speed of the roller passing over the work, the amount of current used and pressure of the roller all combined is very difficult to handle and to get them

properly adjusted. If the pieces are overlapped too much there would be no weld, and if the overlap is too little the joint or metal will burn through and also will burn or pit on to the roller electrode, necessitating constant cleaning off of the roller.

Q. 35. You have referred to the necessity of keeping the work free from scale or rust; what is the effect of such scale or rust?

A. It is impossible to get any kind of weld where the material is rusty.

Q. 36. Have you reference now to electric welding with roller electrodes?

A. Yes, with roller seam welds.

Q. 37. Did the Thomson Company in the first twenty years of your employment make and test a machine with a single roller electrode?

A. It did.

Q. 38. When was that machine made, what use was it put to and what were the results?

A. The years 1906-07 they built one of these machines which was experimented with at the factory and finally shipped to a concern in Connecticut for welding coffee pots. It was kept there several months and finally returned to the factory.

Q. 39. What happened to it after it was returned to the Thomson factory?

A. It is still in existence in the storehouse.

Q. 40. Was it used for electric welding?

A. Not after its return to the factory.

Q. 41. One of the electrodes was a roller; what was the other?

A. What we call a solid horn. In this instance it was a short horn, possibly about ten inches long, from three to four inches in diameter attached with a suitable holding jig to clamp the cylinder to the upper surface.

Q. 42. Did this horn when in use extend into the coffee pot?

A. It did.

Q. 43. Was it in contact with the seam to be welded throughout the entire length of the horn? Please state the arrangement in your own words.

A. The lower copper horn was attached with a sliding contact connected to the transformer of the welder, the coffee pots or cylin-

ders placed on the horn and clamped in position, this carriage or horn then moving on a plane directly beneath the roller electrode. As the roller came in contact with the end of the cylinder the current was turned on and automatically cut off at the opposite ends of the cylinder.

Q. 44. Did you see this machine in operation at the works of the concern in Connecticut to which it was sent?

A. I did.

Q. 45. With what success was it there working?

A. I called there to see what was being done with it, and found that it was not working, due to the troubles which I previously described — making poor welds and the necessity of continually cleaning the copper roller — and they started it up for me and tried several welds showing the results.

Q. 46. In or about the year 1889, Prof. Elihu Thomson appears to have invented a machine for electric soldering and took out a patent, No. 496,019, April 25, 1893, drawings of which I show you. Did the Thomson Company make such machines during your employment with them?

A. They did not.

Q. 47. In or about the year 1891 Hermann Lemp appears to have invented an apparatus for electric welding, shown in patent No. 553,923, February 4, 1896. In that patent Mr. Lemp speaks of an alleged old process of welding shown in Figs. 1 and 2 in which two pairs of roller electrodes are employed. Did the Thomson Company ever build machines to carry out such process while you were employed there?

A. They did not.

Q. 48. Have you ever seen such machines?

A. Nothing of the kind.

Q. 49. Have you ever seen electric welding machines for welding strips in which there were as many as three pairs of contacts as shown in Figs. 3, 4 and 5 of this Lemp patent?

A. I have not.

Q. 50. Are you familiar with spot welding using a pointed electrode?

A. Yes, sir.

Q. 51. Does such a method result in a strong weld?

A. It does.

Q. 52. How does the strength of a weld compare with that of a rivet?

A. About the same.

Q. 53. Is spot welding cheaper than rivetting?

A. A great deal cheaper.

Q. 54. What are the reasons for that?

A. Speed is one thing, as it can be done so much faster, requiring no punching of holes.

Q. 55. Can spot welds be made by the pointed electrode method on work which is not absolutely clean?

A. It can. If the stock is scaly or rusty, the current is left on for a longer period, which can be controlled by the operator in giving it time to burn through the scale or rust.

Q. 56. Have you prepared a specimen of work that can be done by spot welding, using the pointed electrode method?

A. I can.

Q. 57. Does this article show a number of spot welds?

A. Yes, several different kinds of work which can be spot welded.

Q. 58. Were the spot welds made by you personally?

A. They were.

Q. 59. Please explain the peculiarities of some of these spot welds.

A. We have one with about a dozen thin pieces all spot welded together in one operation. Another showing a brace of heavy material welded to the corner section of a case or box. Another of what we call an angle iron welded in a corner of a case, this being a thin section welded to a heavier section. Another with a pipe having a collar or ring welded to the circumference of the pipe. Another which could be described as a cup setting inside of another, both being spot welded together, also a rectangular heavy section welded to a thin section. Still another of a rectangular heavy section having a thin section welded one on each side. The two samples of pipes were welded where neither one could move relatively to the other.

(Plaintiff's counsel offers in evidence an exhibit and the same is marked "Plaintiff's Exhibit No. 18, Specimen of Spot Welds Prepared by Clark".)

Q. 60. In general to what work is electrode spot welding adapted?

A. To plates or pieces of material that can be welded at any point in contact and at any position desired.

Q. 61. Is any preparation of the work necessary for electrode spot welding?

A. There is no preparation needed.

Cross Examination.

By Mr. CHURCH.

X-Q. 62. Mr. Clark, was precisely the same amount of current employed in making each of the spot welds on the exhibit you have produced, or was it varied according to the article operated upon?

A. It was varied.

X-Q. 63. Explain that a little further, especially as to the several pieces of thin section to be welded requiring a greater amount of current to make them weld.

A. The pipe section being two pieces of about equal sections requires more current than where a heavy section is welded to a thin section.

X-Q. 64. And where two thin sections are required to be welded is the current more or less?

A. Less.

X-Q. 65. So that you have to vary the current according to the thickness of the pieces to be welded; is that a fact? How long has that been known to you and the necessity for doing that?

A. Ever since I have done spot welding, possibly six or seven years.

X-Q. 66. You didn't know anything about spot welding before six or seven years ago?

A. I knew of it, but I practiced it very little.

X-Q. 67. Where did you get your first impression in regard to spot welding, — I mean what you call electrode welding?

A. At the factory in Lynn.

X-Q. 68. Was a spot welding machine set up there at Lynn?

A. It was.

X-Q. 69. Who set it up?

A. I think I did myself.

X-Q. 70. Describe what you set up first in the way of a spot welding machine.

A. It was a vertical machine of similar design of any welding machines, except in vertical position it used two pointed electrodes set in the upper and lower horns as we call them, and operated by hand pressure.

×-Q. 71. What did you weld?

A. They were called biscuit pans for some company here in Boston.

×-Q. 72. Do you mean the corners of biscuit pans?

A. Joining the biscuit pans together by small rectangular pieces of steel holding three pans together.

×-Q. 73. How thick were the parts welded together?

A. The pan I should judge was one-sixty-fourth inch, the side pieces about one-sixteenth inch.

×-Q. 74. For what concern was this machine made?

A. The A. F. Ward Baking Company of Boston.

×-Q. 75. Who designed this machine?

A. I think the Thomson Electric Welding Company.

×-Q. 76. You didn't design it, did you?

A. No, sir.

×-Q. 77. Nor did Mr. Rietzel design it?

A. I couldn't say.

×-Q. 78. How long ago was this that the machine was made for the Ward Company?

A. The machine was not made for the Ward Company; the work was done for the Ward Company.

×-Q. 79. What was the date?

A. The machine was built, I believe, as early as 1907 or 1908; but it was not used for spot welding; that is, I didn't use it for spot welding until about the year 1912.

×-Q. 80. It was used for spot welding before you used it, was it not?

A. Not in our factory.

×-Q. 81. Was it used anywhere?

A. I don't think it was.

×-Q. 82. Are we to understand that while you were using the Ward machine you learned this necessity for varying the current to adapt the method to the joining of parts of different thickness?

A. Yes, sir.



X-Q. 83. Your previous experiments in electric welding taught you that, didn't it?

A. Yes, sir.

X-Q. 84. Of what extreme thinness can articles be spot welded together?

A. Thirty gauge has been spot welded. I couldn't say the thickness in fractions of an inch.

X-Q. 85. How thick may the materials be that may be spot welded?

A. Personally I have only been able to weld two plates or sheets of one-quarter inch each in thickness.

X-Q. 86. But you think they may be varied if you have a competent machine and enough current?

A. They have been experimented with one-half inch plates without any great results.

X-Q. 87. You don't know who got up the design for the first spot welding machine that was constructed or used at the Lynn factory, do you, for the Thomson Electric Welding Company?

A. I do not; it was in Mr. Rietzel's time.

X-Q. 88. And it may have been him?

A. Possibly.

X-Q. 89. When Mr. Rietzel left the Thomson Electric Welding Company he went to the Universal Electric Welding Company, did he not?

A. Yes.

X-Q. 90. That was some time in 1907, was it not?

A. I think about that year.

X-Q. 91. Was Mr. Rietzel a skillful man as an electric welder?

A. Yes; he was continually experimenting.

X-Q. 92. He was the foreman of the Thomson Electric Welding Company, or the manager of that company, before he left, was he not?

A. Yes; I should say superintendent and acting manager.

X-Q. 93. And occupied quite a responsible position there?

A. Yes.

X-Q. 94. Was regarded as a good man?

A. Yes.

X-Q. 95. How recently have you seen Mr. Adolph F. Rietzel?

A. I met him at the factory I think in January of this year.

×-Q. 96. You mean at your factory?

A. Yes.

×-Q. 97. What was he doing there?

A. I don't know what his business was.

×-Q. 98. Is he employed there now?

A. No, sir; I think not.

×-Q. 99. How recently has he done work for the Thomson Company?

A. I couldn't say.

×-Q. 100. Give your best judgment.

A. The last that I know of he was in Philadelphia with me.

×-Q. 101. When was that?

A. That was in May of last year.

×-Q. 102. What was he doing there for the Thomson Company?

A. He was trying to help us out in getting welders started on ammunition work.

×-Q. 103. Was he there in behalf of the Thomson Electric Welder Company or the Thomson Spot Welder Company?

A. The Thomson Electric Welding Company.

×-Q. 104. As I understand it, they are distinct concerns?

A. Yes, sir.

×-Q. 105. Does the Thomson Electric Welding Company make spot welders for the Thomson Spot Welder Company?

A. Yes.

×-Q. 106. How long have they been doing that?

A. I should say two years.

×-Q. 107. In fact all the machinery spot welders being used by the Thomson Spot Welder Company are made for that company by the Thomson Electric Welding Company, are they not, so far as you know?

A. I couldn't say just how the two are combined.

×-Q. 108. But you know that their relations are very close?

A. Yes. The Thomson Spot Welder Company is probably located in Cincinnati; their line of spot welders are universally used. Only the main office of the Spot Welder Company is at Lynn.

×-Q. 109. But still the Thomson Electric Welding Company of

Lynn does build some spot welders for the Thomson Spot Welder Company; is that a fact?

A. I should say not. Not the regular line of spot welders.

X-Q. 110. The irregular line, then?

A. Yes, they do some work for them.

X-Q. 111. Any kind of spot welding, I mean electrode welding, whether upon thick or thin plates or of thick and thin plates, is best accomplished where the surfaces to be welded are clean, is it not?

A. It can be done quicker that way.

X-Q. 112. All other things considered, it is best to have the surface clean, is it not?

A. Yes, sir.

X-Q. 113. And that can be accomplished by rubbing or by pickling or by other methods, can it not?

A. It can be.

X-Q. 114. You do not desire to leave upon the mind of the court the impression that lap welding of clean metal plates may not be accomplished by the used of one or more roller electrodes, do you?

A. It can be done.

X-Q. 115. Have you seen it done?

A. One roller electrode, not using two.

X-Q. 116. You mean to leave upon the mind of the court the impression that lap welding involving the production of a continuous seam may not be effected between two overlapped plates by the employment of two co-operating roller electrodes?

A. It may be possible to do it.

X-Q. 117. You say that it is impossible to do it?

A. It may be possible.

X-Q. 118. Do you consider yourself up-to-date in the matter of electric welding?

A. Yes.

X-Q. 119. Do you not know that it is a common practice to employ roller electrodes in electric seam welding?

A. It is, but it is limited to certain conditions.

X-Q. 120. What are those conditions?

A. The material thickness and condition of the material.

×-Q. 121. You mean to say that the application of roller electrodes is not so universal as the application of pointed electrodes?

A. Yes, sir.

×-Q. 122. For many years the Thomson Electric Welding Company was in control of the electric welding industry,— I mean by that resistance, welding under the Thomson patents,— was it not?

A. I am not familiar with any of the patent situations at all.

×-Q. 123. But there were many years in which the Thomson Company really had no competitors in electric welding ; that is true, is it not?

A. Yes, sir.

×-Q. 124. Have you ever known of the successful commercial use of an electric welding machine employing two roller electrodes?

A. No, sir.

Signature and certificate waived by consent of counsel.  
Adjourned until further notice.

BOSTON, MASS., May 8, 1919, at 2 p. m., 84 State Street.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, Esq., for Plaintiff;

ROBERT CUSHMAN, Esq., for Defendant.

*Deposition of Hermann Lemp.*

HERMANN LEMP, a witness called by and on behalf of plaintiff, having been duly sworn, deposes and says:—

*Direct Examination.*

By Mr. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation.

A. Hermann Lemp; fifty-six years; works engineer for the General Electric Company, Erie works, Erie, Pennsylvania.

Q. 2. Are you employed by the Thomson Electric Welding Company, or the Thomson Spot Welder Company?

A. No, not since 1896.

Q. 3. Are you the Hermann Lemp, patentee of patent No. 553,923?

A. Yes.

Q. 4. Have you recently read that patent?

A. I have.

Q. 5. Referring now to Figs. 1 and 2 of that patent, which according to the specification illustrates an apparatus that might be used for welding in a manner employed previous to your invention, please state what method previously employed is therein referred to and illustrated in these Figures Nos. 1 and 2.

A. The apparatus illustrated in Fig. 1 may be used for two different methods, the one illustrated in a previous patent by Professor Elihu Thomson for continuously lap welding sheets of steel or iron, and the other one employed by me for the same purpose or for welding strips of metal together, the difference between the two methods being that in the first the current is passed transversely, while in the latter the sheets to be welded are heated by currents passing longitudinally through the parts to be welded together, and being finally united by pressure, but without necessarily a current passing through the joint.

Q. 6. In those previous methods what was the relation of the electrodes to the overlapped sheets?

A. In both of these methods the electrodes would either entirely overlap the strips to be welded or completely overlap one side. These have particular reference to lap welded joints where the edges are covered by the electrodes proper.

Q. 7. When the methods were applied to welding strips, what was the relation of the electrodes to the strips?

A. The electrodes would completely cover the whole width of the strip or exceed it,—overlap it on either side.

Q. 8. In those old methods please state whether the parts welded together were welded over their entire contacting area.

A. Yes, they were.

Q. 9. State whether that is true of not only the old methods referred to but to the methods embodying your invention and set forth in that patent.

(Objected to by Mr. Cushman that the patent is the best and only evidence of what is set forth in it.)

A. Yes, it covers both the old and the new.

Q. 10. How do you reconcile these facts with the showing of Fig. 2 of your patent?

A. The only way I can explain this discrepancy is an error of the draftsman at the time this illustration was made.

Q. 11. Has the method of your patent No. 553,923 gone into practical use?

A. No, it never went by the experimental stage.

Cross Examination.

By Mr. CUSHMAN.

×-Q. 12. Is there any doubt in your mind that roller welding of the character shown in your patent No. 553,923 is practicable?

A. As I remember, the experiments that were made at the time I considered it feasible, but there was not demand enough at the time to call for it.

Signature and certificate waived by consent of counsel.

Plaintiff's counsel offers in evidence a copy of the patent to DeFerranti, No. 906,400; the same is marked "Plaintiff's Exhibit No. 19, DeFerranti Patent No. 906,400".

DETROIT, MICH., May 19, 1919.

*Testimony taken before Hon. John M. Killits.*

JAMES H. GRAVELL, after being duly sworn on behalf of the plaintiff, testified as follows:—

Direct Examination.

By Mr. STACKPOLE.

Q. 1. You have already testified in this case?

A. Yes, sir.

Q. 2. Will you produce a few samples of commercial electrical spot welding, and show the court the spot welds on the articles; say what they are and where they are spot welded?

A. This sample which I hold in my hand was secured from one of the local Detroit concerns. It consists of a waste basket, the basket is made of a number of sheet panels with corner pieces, and the sheet panels are attached together by a number of spot welds. By slanting the eyesight on them, the positions of these spot welds are very evident.

(Plaintiff's counsel offers the spot welded waste paper basket in evidence as "Plaintiff's Exhibit No. 20, Spot Welded Waste Paper Basket".)

Q. 3. Have you another example of commercial spot welding?

A. Yes; this sample which I now hold was secured from one of the local Detroit concerns and consists of a fisherman's outfit or basket; the whole article is made of sheet steel and the electric welding is made noticeable on the inner tray. I am told this is of advantage over the wood, because of the wetness which accompanies the business of fishing which warps the wood out of shape. Those are partitions [*indicating*] in one of the members, and all these partitions are planned to make the sheets overlap and connected together with spot welds. These are painted, but by slanting the light on the article you can see the spot welds.

Mr. FISH. Will you show one of the rivets on the corner, the brass rivets?

A. The fittings in this case are made of brass, and in some cases the brass does not come in facial contact with the metal of the case, and in those places the parts are connected by brass rivets.

Mr. FISH. Just to show a rivet, that is all, your Honor.

Mr. STACKPOLE. We offer this in evidence as "Complainant's Exhibit No. 21, Spot Welding Fisherman's Box".

Q. 4. Have you another sample of electric spot welding?

A. The sample I now hold was not secured by me, but it can be easily recognized as a chimney used on car heating systems, and I believe in this city it is used on the street cars, as I think I have noticed these chimneys on the Detroit cars. These chimneys are stamped metal parts which are united by spot welds. This sample is also painted, but the evidence of the spot welds is indicated by slanting the light on the sample.

Mr. STACKPOLE. I offer this in evidence as "Plaintiff's Exhibit No. 22, Spot Welded Stove Pipe Top".

Q. 5. And have you another sample of commercial spot welding?

A. This sample was also secured by me in one of the local Detroit stores. It consists of a small saucepan, the handle of which has been electrically welded. The article has been enamelled and it is very difficult to detect exactly where the spot welds are. The little blemishes on the handle are due to imperfections in the enamelling, as by looking through the handle you can see it is not a rivet, but spot welded; you can see it in the centre of the handle.

Mr. STACKPOLE. I offer that as "Plaintiff's Exhibit No. 23, Spot Welded Saucepan".

Q. 6. I show you another example of spot welding. What does that appear to be?

A. From the name stamped on the small piece it is evident this is the outer casing of a Ford radiator or apron placed in the top of a metal frame, and are secured thereto by a number of spot welds. These spot welds, owing to the enamelling of the article, are practically invisible on the outer side of the radiator case, but are plainly visible from the inside.

Mr. STACKPOLE. I offer that in evidence as "Plaintiff's Exhibit No. 24, Outer Casing of Ford Radiator".

Q. 7. Have you just been up to the shop of the Steel Products Company with the court and counsel, and did you there exhibit a butt welding machine and a spot welding machine?

A. Yes, sir.

Q. 8. Is this the specimen of the butt welding that you made on the machine in the presence of the court and counsel?

A. This is the sample I made.

Mr. STACKPOLE. I offer that in evidence as "Plaintiff's Exhibit No. 25, Sample of Butt Welding".

Q. 9. And are these the samples of spot welding that you did?

A. Yes, these are the samples of spot welding I did.

Q. 10. How thick is the metal of the larger sample?

A. I will have to estimate this; I have no measuring instruments with me, but it is between one-thirty-second and one-sixteenth of an inch thick. Both sheets are of the same quality of steel and both sheets are of the same thickness.

Mr. STACKPOLE. The large sample is offered in evidence as "Plaintiff's Exhibit 26, Large Sample of Spot Welding".

Q. 11. Is this a smaller sample of spot welding?

A. Yes, sir; this sample consists of sheets approximately .014 of an inch in thickness. I did this this morning.

Mr. STACKPOLE. I offer in evidence this as "Plaintiff's Exhibit No. 27, Small Sample of Spot Welding".



Q. 12. I notice on this large sample the spot welds, some of them, are rough; what is the cause of that?

A. This particular machine has a number of adjustments or positions for welding, and as this was my first experience on the machine, it requires a little experience to adjust the machine properly for any special line of work. The weld made was simply to show the general idea of spot welding, and no effort was made to produce what might be called good looking spot welds. In some cases the current was a little too strong for the size of the sheets, but as probably you noticed this morning, I adjusted the machine to give the proper result.

Q. 13. When you spoke of seeing the spot welding machines used at the Ford plant were they standard commercial welding machines?

A. Yes, sir.

Q. 14. Of the ordinary kind?

A. Of the ordinary kind.

No cross-examination.

Mr. STACKPOLE. That closes what *prima facie* evidence we wish to offer at this time.

### *Testimony in Rebuttal.*

BOSTON, MASS., June 16, 1919, 11 o'clock A. M.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, Esq., Counsel for Plaintiff;

MELVILLE CHURCH, Esq., Counsel for Defendant.

Depositions taken under the statutes of the United States and Equity Rules on behalf of the plaintiff in the above-entitled case before me,

HECTOR M. HOLMES,

*Notary Public.*

### *Deposition of L. Curtis Brewer.*

L. CURTIS BREWER, having been duly sworn, deposes and says as follows:—

#### Direct Examination.

By Mr. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation.

A. Lawrence Curtis Brewer; age, forty-two; I live at St. Paul, Minnesota; I am a boss carpenter, construction work.

Q. 2. You are in business for yourself?

A. No, not at present.

Q. 3. Have you any connections with the Thomson Spot Welder Company?

A. I have not.

Q. 4. With the Ford Company?

A. I have not.

Q. 5. Were you ever employed by the Warren Electric and Specialty Company of Warren, Ohio?

A. I was.

Q. 6. While you were employed by that company, which I will call the "Warren Company", were you employed as a worker on electric fans?

A. Yes, sir.

Q. 7. What part of the electric fan did you work on?

A. The guards,— fan guards.

Q. 8. Did those fan guards include rings?

A. Yes, sir.

Q. 9. Of what material were those rings made?

A. Iron.

Q. 10. How were the ends of those rings secured together?

A. They were soldered in a sleeve, then they were brazed and then they were welded,— butt welded.

Q. 11. Do you recall the device or machine by which they were welded?

A. Yes, sir, I remember the machine.

Q. 12. On whose bench was this machine placed in the factory?

A. On the bench that I worked on.

Q. 13. Did you work on this machine?

A. I did.

Q. 14. What did you do with this welding machine?

A. I butt welded the rings for the fan guards.

Q. 15. Who was the first operator to work on this machine after it was set in place?

A. I was the first regular operator.

Q. 16. For how many years did you operate that machine?

A. About four years.

Q. 17. What other regular operators were there on that machine?

A. None while I was there in the employment of that company.

Q. 18. You say that you made the fan guards. How did you make the fan guards, what material did you use and what did you do to it?

A. We received the iron as I remember it in straight lengths. I formed the rings from those lengths of iron in a forming machine. The spokes came in lengths. I also formed the spokes, put the fan guards together, welded it, welded the rings and built the guard complete.

Q. 19. Did you do all this work on one bench?

A. Yes, sir.

Q. 20. Will you make a sketch of your bench on which you did this work, showing the position of the several devices employed by you in making the fan guards and explain the sketch?

A. I have made such a sketch.

Q. 21. Please explain your sketch and how you made the fan guards in connection therewith.

A. The first operation was on the heavy rods used in making the large rings, forming the rods in a circle or ring. The next operation was forming of the spokes, which were then strung on the top ring of guard, then welded, butt welded on welding machine. Then the weld was ground by the motor wheel set in emery. Then the fan guard was built up and the hooks were closed, completing the building of the fan guard.

Mr. STACKPOLE. The sketch offered as prepared by the witness is offered in evidence as "Plaintiff's Exhibit No. 31, Brewer's Sketch of his Work Bench".

Q. 22. Will you describe the welding machine or device which you employed to butt weld the ends of the guard rings, making a sketch if that will help you?

A. This machine, as I remember it, was built on a block of fibre, the fibre being from five-eighths to one inch thick, with copper blocks or jaws to hold the ring, rings being welded closed by levers, of which there were four, two clamping the rings, and two levers butting ends of ring together, electric current controlled by foot lever.

Q. 23. Have you made a sketch of the device?

A. I have a sketch here showing something of the device of the thing. I am not much of a free-hand drawer.

Q. 24. You have referred to a piece of fibre under the clamps. How big was the fibre in its area?

A. About eight by ten, as I remember it.

Q. 25. Were there any slits in this piece of fibre?

Mr. CHURCH. Objected to as leading.

Mr. STACKPOLE. You may answer the question.

A. Not while I worked on this machine.

Q. 26. How was this piece of fibre fastened to the bench?

A. Screwed to the bench to my recollection.

Q. 27. Did the clamps extend beyond the edge of the bench?

A. Yes, the length of the handles. Did you mean the clamps that clamped the ring?

Q. 28. Yes.

A. They did not. Not to my knowledge.

Q. 29. To make this matter exactly clear, what parts of the device did extend beyond the edge of the bench?

A. The handles of the machine.

Q. 30. Do you recall the work of putting this electric welding device on your bench?

A. Yes, sir.

Q. 31. State whether or not the bench was cut with a slit for this machine.

Mr. CHURCH. Objected to as leading.

A. It was not.

Q. 32. You have stated that your work was to butt weld the ends of the fan guard rings on this machine. Please describe what you did with the rings and how you made the weld.

A. After the rings were formed the ends were placed into the machine, clamped and welded.

(Plaintiff's counsel offers in evidence the sketch of the machine produced by the witness, the same to be marked "Plaintiff's Exhibit No. 32, Brewer's Sketch of Welding Machine".)

Q. 33. Was Mr. Fred P. McBerty employed by the Warren Electric and Specialty Company at the time you worked on this machine?

A. Yes.

Q. 34. What was his job?

A. Superintendent I think, if I remember it right.

Q. 35. What did he have to do with this electric welding machine?

A. To my knowledge it was built under his instructions.

Q. 36. What did he have to do with operating it, if anything?

A. Nothing.

Q. 37. I show you a photograph which has been put in evidence by the defendant in this case showing a device. Generally speaking, what does this photograph represent?

A. It represents the welding machine.

Q. 38. Is that photograph a true representation of the welding machine in all particulars?

A. To my recollection the machine did not extend out from the bench as this is shown and it is not the bench upon which I worked.

Q. 39. State whether or not this photograph shows the fibre plate on which the machine was mounted.

A. This photograph does not show the fibre plate.

Q. 40. What does the photograph show as the basis of the clamping device?

A. It shows it mounted on angles with a slot between.

Q. 41. When you worked on the machine was the device mounted on angles?

A. It was not.

Q. 42. When you worked on this machine and on this bench making fan guards were you paid by the day or by the piece?

A. I was first paid by the day, then by the piece.

Q. 43. Were the rings soldered before or after they were welded? I mean by that, how were the first rings fastened together for this fan,— were they soldered or were they welded?

A. You mean at the beginning of the making of this fan before the welder came out, — you mean that?

Q. 44. Yes.

A. To my recollection those rings were soldered, and then, if I remember right, they were then brazed and then welded.

Q. 45. Do you recall the central spiders and blades which were assembled in the fans for which you made the guards?

A. Yes, sir.

Q. 46. Of what material were those spiders and blades?

A. The blades were iron and the spiders to my recollection were brass.

Q. 47. Were there any steel or iron spiders?

A. They used steel and iron spiders to my recollection, though the spiders used mostly were brass.

Q. 48. Were the blades which were made of iron or steel bright or dark colored?

Mr. CHURCH. Objected to as leading.

A. They were of a dark color, not polished.

Q. 49. How were the blades and spiders joined together?

A. They were riveted, to my recollection, while I was in the employment of this company.

Q. 50. How were the blades prepared for riveting?

A. We received the blades from an outside firm, if I remember it, the rivet holes being punched. The blades were flat and were formed in the factory, concaved. The spiders were drilled and the blades were riveted to the spiders.

Q. 51. Do you recall any other method of fastening the blades to the spiders than riveting?

A. No, sir.

Q. 52. Do you recall any other welding done on this machine except the butt welding of the ends of fan guard rings which you have already referred to?

A. No, sir.

Q. 53. What was the shape of the spider arms to which the blades were attached? Were they straight or were they otherwise shaped?

A. Well, the spider was twisted in the shape of a wind wheel.

Q. 54. About how many years ago was it that this machine was set up and operated at the Warren Company?

A. In the latter part of 1901 and the first part of 1902, to my recollection; that is as near as I can remember it.

Q. 55. Do you know Mr. William Smith, who is here present?

A. Yes, sir.

Q. 56. Was he employed by the Warren Company at the time this welding machine was set up and operated?

A. Yes, sir.

Q. 57. Did he have anything to do with the setting up and operating of it?

A. Not to my recollection.

Q. 58. Were you ever visited by Mr. Smith and asked concerning your recollection of this machine?

A. Yes, sir.

Q. 59. When?

A. Some time during 1917.

Q. 60. Where?

A. St. Paul, Minnesota.

Q. 61. What was the substance of your conversation with Mr. Smith at that time?

A. Regarding my operating the welding machine. He asked me if I knew there had been any spot welding done on this machine. If I remember it right, I told Mr. Smith that I had not seen any spot welding done on this machine.

Q. 62. Did Mr. Smith show you any photographs or drawings?

A. If I remember it, I think Mr. Smith or some one sent me two photographs.

Q. 63. What did those photographs show?

A. One was a duplicate of this picture of the welder [*referring to photograph mentioned before as exhibit of the defendant*]. The other showed one of the fans complete, showing the blades, guards, in fact, the fan complete showing no rivet heads on the blades.

Q. 64. Do you recall what was the purpose of showing you these photographs?

Mr. CHURCH. Objected to as incompetent.

A. He stated to me that there was some company had a spot welding machine and they claimed to be the first, and that they were claiming McBerty and that outfit to be the first people to do spot welding and wanted a statement from me as to what I knew about the machine.

Q. 65. Did you give him a statement?

A. I don't remember of giving them any written statement. Not any more than a verbal statement, which I told Mr. Smith that I did not remember seeing any spot welding done on this machine.

Q. 66. Did Mr. Smith explain to you what he meant by spot welding?

A. Yes, sir.

Q. 67. What was that?

A. When two pieces of metal were welded in a spot in place of a rivet.

Q. 68. Before Mr. Smith explained this to you, what knowledge had you had of spot welding?

A. None whatever.

Q. 69. Where are the photographs that were sent you either by Mr. McBerty or by Mr. Smith?

A. They are now in St. Paul, Minnesota.

Q. 70. Will you please mark those with your name and with the statement that they were sent to you by Mr. McBerty or by Mr. Smith, as the case may be, and forward them to me with any letters or copies of letters that may have come with them?

A. Yes, sir.

Q. 71. Referring again to the welding device which you used at the Warren Company, were the clamping blocks cut or prepared in any way for holding the rings?

A. They were grooved, something in the shape of the iron ring which they were to receive.

Q. 72. And what was the position of the rings when you welded them? Did they lie in a horizontal plane or in a vertical plane?

A. Horizontally, I believe, as I remember it.

Direct examination closed.

#### Cross Examination.

By Mr. CHURCH.

×-Q. 73. While you were at work in the Warren Electric and Specialty Company it was not your job to connect the fan blades to the spider, was it?

A. No, sir.

×-Q. 74. Did no one to your knowledge besides yourself ever use this electric welding machine at the Warren shop?

A. When the machine was first set up Mr. McBerty made a few butt welds showing me how the machine was operated. Other than that I don't remember of anyone else ever working on the machine during my employment with this company.



×-Q. 75. But others might have worked on the machine? They might have done work on that machine without your knowledge?

A. They might have done it at night.

×-Q. 76. But when you were absent from the machine?

A. I was there most of the time. I stepped out and back because that was my work, and I would have known if anyone else was working on the machine.

×-Q. 77. But when you were out to luncheon or dinner or absent from that machine it might have been used by others, might it not?

A. Oh, yes, it might have.

×-Q. 78. Would you swear positively that that machine was not used by anybody but yourself?

A. No.

×-Q. 79. How long have you been in Boston on this trip?

A. I landed at 6.10 Saturday evening.

×-Q. 80. A week ago Saturday?

A. No, this Saturday, the 14th; today is the 16th.

×-Q. 81. When did you leave St. Paul?

A. Thursday evening, the 12th.

×-Q. 82. And where did you meet your brother?

A. My brother came to my home in St. Paul.

×-Q. 83. Who sent him there?

A. Mr. Lyne asked me if I would get a statement from my brother, who lives at Haywood, Wisconsin, and I made a trip to Haywood, Wisconsin, and asked my brother for this statement and he sent it.

×-Q. 84. When did Mr. Lyne ask you for this?

A. Mr. Lyne was in St. Paul some time during the first part of May I believe, if I remember it,— along the first part of May.

×-Q. 85. And when did you first go to see your brother about this matter?

A. About the 27th or 28th of May.

×-Q. 86. Do you know Mr. E. B. Craft?

A. E. B. Craft. I don't think so.

×-Q. 87. Didn't Mr. E. B. Craft at one time work with the Warren Electric and Specialty Company? He was quite a young fellow then.

A. I don't remember the man at all. I don't remember the name E. B. Craft.

×-Q. 88. You have not been shown recently, have you, that welder that you saw and worked with at the Warren factory?

A. I have never seen it since I worked on it.

×-Q. 89. You don't mean to imply by your testimony that all the work that was done on those fan guards was done in one room and all done by you, do you?

A. I received nine cents apiece for the fan guard built from the straight iron complete.

×-Q. 90. Did you japan them?

A. No, sir; they were not japanned. They were dipped in a solder, blocked, tinned and nickel-plated, which I did.

×-Q. 91. But I don't understand that you always were paid by piece work, do I? Didn't you say that you were paid by the day?

A. At the start of my employment there I did not work on piece work. Very shortly after I was employed there I went on piece work.

×-Q. 92. When Mr. Smith came to see you at St. Paul where did you see him there?

A. If I remember it right, I think Mr. Smith came to my home.

×-Q. 93. Where was that?

A. That was at 155 Ninth Avenue, if I remember. It was a double house and I lived in both sides of that house; I might have been at 153. It was either one side or the other.

×-Q. 94. But it was at one or the other of those places?

A. At one or the other.

×-Q. 95. You have not got a very good memory, have you?

A. Well, I have always had a pretty good memory of things that went on.

×-Q. 96. Please try to recall any other thing that happened when Mr. Smith came to see you in St. Paul.

A. I don't remember of anything.

×-Q. 97. Now, is it not a fact that Mr. Smith did not have an interview with you at St. Paul, but at Warren, Ohio, where you had gone to attend your sick father?

A. I also had an interview with Mr. Smith at Warren, Ohio.

×-Q. 98. Mr. Smith, who is here, tells me that he was never in St. Paul in his life.

A. To my recollection, Mr. Smith and I had an interview at St. Paul, also another at Warren, Ohio.

X-Q. 99. Well, you may be mistaken about his having an interview with you in St. Paul, may you not?

A. The statement which I gave before covers that question.

X-Q. 99a. Please answer my question.

A. To the best of my recollection I had an interview with Mr. Smith in St. Paul.

X-Q. 100. But you may be mistaken about it. Is that a fact?

A. It is possible; yes.

X-Q. 101. What was the name of your father?

A. William M. Brewer.

X-Q. 102. Did he ever work for the Warren Electric and Specialty Company?

A. Yes, sir.

X-Q. 103. Where did he work?

A. In the packing department.

X-Q. 104. Did you ever assist your father in the packing department?

A. Yes, I have at times,—a few times in the early part of my employment with this company.

X-Q. 105. Where did you take the guards after you had formed them for the purpose of tinning them?

A. Down in the paint shop.

X-Q. 106. Where was that?

A. That was in a separate building at the rear end of the building in which I worked.

X-Q. 107. What was the tinning process that you have referred to?

A. It was block tin and soldered, melted, the guards were dipped in this hot solder and block tinned.

X-Q. 108. Describe a little more in detail how this dipping preparation occurred.

A. They were first dipped in a solution of muriatic acid, as I remember it, then into hot lead, the drops knocked off by a jar and finished.

X-Q. 109. Well, after they were tinned they were taken back to your department?

A. No, sir; they were taken to the department where they were lacquered.

X-Q. 110. But you took them to the tinning department?

A. Yes, sir.

X-Q. 111. How many of these guards did you construct in a day by means of this welding machine?

A. Well, it ranged between thirty and eighty.

X-Q. 112. Did you yourself do any of the tinning?

A. I did all the tinning.

X-Q. 113. Was that a part of your job?

A. That was a part of it, yes; guards complete.

X-Q. 114. Were you paid for the guards complete, that is, after they were tinned?

A. I was paid nine cents each for the guards built. I was then paid on an hourly basis for tinning the guards for the hours that I was on tinning.

X-Q. 115. Are we to understand that you were paid for building the guards and paid additional for tinning them?

A. Yes, sir.

X-Q. 116. While you were at the Warren Electric and Specialty Company did you ever drill any of the hubs or spiders for receiving the rivets?

A. Yes, on a bet, or a wager.

X-Q. 117. Well what was that wager?

A. Mr. Blood and I made a wager,—he was the man that drilled spiders, and I made a wager with him for \$5.00 that I could drill 1,000 in one day, ten hours; that was the only drilling that I have done on spiders, to my recollection, and they were brass.

X-Q. 118. Well, did you win the bet?

A. I did not. Mr. Jack Powers slowed down the motor in the afternoon and I lost the bet because the drill press was not running at high speed.

X-Q. 119. Is it not the fact that when small guard rings were welded on this machine they were sometimes welded in a vertical position instead of a horizontal position?

A. You could weld on this machine both ways. It was possible.

X-Q. 120. The large guard rings were usually welded in a horizontal position?

A. Yes.

X-Q. 121. Do you remember the long strips of steel from which the blades of those fans were punched at the Warren factory?

A. No, sir, I don't. I don't remember that part of it. I remember the punching of the discs forming the armature, but not of the blades.

X-Q. 122. Referring again to this so-called interview with Mr. Smith at St. Paul, was it at night or during the day time?

A. It was in the evening, if I remember it.

X-Q. 123. Who else was present besides yourself and Mr. Smith?

A. No one. I don't think there was.

X-Q. 124. Are you as certain that Mr. Smith had this interview with you at St. Paul as you are about everything else that you have stated in your testimony?

A. I would not say positively as to my meeting Mr. Smith in St. Paul, but I had some idea that I had had an interview with Mr. Smith in St. Paul. Being uninteresting to me I may be wrong in this statement, but I had an interview with Mr. Smith, I am positive, in Warren, Ohio, when I visited my sick father.

X-Q. 125. When was that?

A. Along about the middle of May, 1917.

X-Q. 126. Who prepared the bath in which these guards were dipped for the tinning preparation?

A. I did.

X-Q. 127. Tell us how that was done.

A. It was a mixture of block tin and solder about, I should say, one-third,—if I remember it,—one-third block tin and the other two-thirds was solder, if I remember it right.

X-Q. 128. What did you do with these ingredients?

A. Put them in an iron kettle or pot, built a good fire under it, heated it to a certain degree of heat that would melt the metal and dipped the guards into this hot metal.

X-Q. 129. And you mixed the metals, built the fire and did the dipping and performed the operation for getting the excess off?

A. Yes, sir.

X-Q. 130. Then what did you do with them?

A. Took them to Wakefield's room. Mr. Wakefield was the

man that done the lacquering at that time, and I took them to his room.

X-Q. 131. Yes; but you had to pickle these things before you dipped them?

A. They were pickled in the muriatic acid.

X-Q. 132. Who prepared that muriatic acid bath, yourself?

A. Yes, sir.

X-Q. 133. Well, all this took considerable time, didn't it?

A. Well, on an average of three days in two weeks. I would make guards for five or six days and might be in the paint shop a half a day or a whole day at a time and dip what I had made previously and then go back up and make the guards again.

X-Q. 134. And while you were processing, so to speak, these guards down stairs or in those other places, you were, of course, not working on your welding machine?

A. No, sir; at that time I was not working on the welding machine.

X-Q. 135. Now, going back to the welding machine, I wish you would describe in as much particularity as you may just exactly how you welded the guard on that machine, starting from the beginning and ending with the final operation which resulted in the completion of the weld.

A. After the rings being formed from a straight iron there were ten spokes, if I remember it, to be strung on one of the rings, the top ring of the fan, the spokes being hooked at either end, one hooked to the top ring of guard, the other hooked to centre ring of guard. After the spokes were strung on top ring of guard it was then welded on welding machine.

X-Q. 136. I want you to give me the details of the welding operation.

A. The rings were placed in jaws of welding machine, two of the levers clamping rings in the jaws, two of the levers butting ends of rings together to make the contact for welding.

X-Q. 137. Was that all?

A. That was all there was to it, besides stepping on the pedal, putting on the current and taking it off when you are ready. The current was controlled by foot pedal.

X-Q. 138. Was not there a transformer connected with that machine, an electrical transformer?

A. There was a transformer connected.

X-Q. 139. What did that do?

A. As I am not an electrician, I could not state the function of transformer.

X-Q. 140. But you recall that there was one there?

A. Yes, sir.

X-Q. 141. I am going to ask you again to describe exactly where the pickling and tinning of these guards was done,— where the place was located.

A. During my employment with this company the pickling or tinning was first done in a blacksmith shop in the rear of the lacquering factory. Later, in the building in the rear of the fan motor factory in a separate building, brick, in the basement.

X-Q. 142. Was that what you would call the annealing room?

A. No, sir; to my recollection it was called the paint shop or bake oven in the latter building.

X-Q. 143. As a matter of fact, wasn't this pickling and tinning done in the same annealing room in which Mr. W. E. Smith worked in the annealing of transformer plates?

A. That I don't remember.

X-Q. 144. Would you say it was not done there — would you?

A. No, sir.

X-Q. 145. It might well have been done and you have no recollection of it?

A. I have no recollection of it.

Cross-examination closed.

Redirect Examination.

By Mr. STACKPOLE.

RDQ. 146. While you were in the employ of the Warren Company and making these fan guards was there any other regular operator employed to work on the workbench at which you worked?

A. No, sir. There were no other regular operators. At times in the busy season I had a helper who bent spokes entirely, never working on the welding machine to my knowledge.

RDQ. 147. Have you any interest in this case?

A. I have not; none whatsoever.

RDQ. 148. At the time you were working on this welding machine, was your brother, C. R. Brewer, employed by the Warren Company?

A. He was.

RDQ. 149. What was his work?

A. He built the cores of armatures for the fans.

RDQ. 150. Did he work in the same room with you?

A. Part of the time.

Signature and certificate waived.

*Deposition of C. R. Brewer.*

C. R. BREWER, having been duly sworn, deposes and says as follows: —

Direct Examination.

By Mr. STACKPOLE.

Q. 1. What is your name?

A. Charles Raymond Brewer.

Q. 2. Your age?

A. Thirty-seven.

Q. 3. Your occupation?

A. General superintendent of construction.

Q. 4. Where?

A. Most any place; different cities of the United States.

Q. 5. Where do you live?

A. I live in Hayward, Wisconsin.

Q. 6. Have you any connection with the Thomson Spot Welder Company or the Ford Motor Company?

A. I have not.

Q. 7. Have you any interest in this case?

A. No, sir.

Q. 8. Were you ever employed by the Warren Electric and Specialty Company of Warren, Ohio?

A. I was.

Q. 9. Were you employed there at the time your brother, L. Curtis Brewer, was butt welding fan guard rings on an electric welding machine?



A. Part of the time.

Q. 10. In what capacity were you employed at that time?

A. Well I was employed in different departments of the Warren Specialty Company. I was employed in the machine shop, in the transformer shop and in the fan motor department.

Q. 11. Did you ever see your brother butt weld fan guard rings on this machine?

A. I have.

Q. 12. Did you ever see anybody else welding on this machine?

A. I saw Mr. McBerty, Mr. McCurdy and Mr. Powers I believe, that is, when the machine was set up and tried out.

Q. 13. After the machine was set up and tried out did you see anybody else except your brother working on the machine?

A. No, sir.

Q. 14. How frequently did you see the machine?

A. Every day during my employment in the fan department.

Q. 15. Were you employed in the fan department at the time the machine was set up?

A. Yes, sir.

Q. 16. How many years were you employed by the Warren Company?

A. Parts of 1901, 1902 and 1903, in their busy seasons.

Q. 17. Can you describe the electrical device or welding machine which was used by your brother for butt welding the ends of fan guard rings?

A. As I remember it, it was a small machine placed upon a bench, the levers or handles projecting from the bench entirely, that is, the handles, and there being some sort of an insulated cardboard or fibre between the bench and the base of the welding machine. There are two clamps that held the ring in place and two clamps used for drawing the ends of rings together while making the weld.

Q. 18. You stated that there was a piece of fibre between the machine and the bench. State whether or not that piece of fibre was slit or not.

Mr. CHURCH. Objected to as leading.

A. As I remember it, the base was solid. There were no holes through the bench or through the fibre as I remember it.

Q. 19. I show you a photograph of a welding machine offered in evidence by the defendant. Does that photograph show generally the nature of the welding machine employed by the Warren Company at that time?

Mr. CHURCH. Objected to as leading.

A. It does with the exceptions of protruding from the bench and the base of the machine.

Q. 20. What do you mean by that?

A. As I remember the machine, it was mounted entirely upon the bench and did not protrude beyond the bench and had a solid iron base insulated by fibre or cardboard between the bench and the machine.

Q. 21. The photograph shows two angle irons. Were such angle irons on the machine?

A. Not as I recall the machine.

Q. 22. Did you ever see any other welding work done with this welding machine except the butt welding of the ends of fan guard rings?

A. I never did.

Q. 23. Do you know what spot welding is?

A. Yes, sir.

Q. 24. Did you ever see any spot welding done on this machine?

A. I never did.

Q. 25. Did you ever see any pieces that had been spot welded at that time?

A. No, sir, not at that time.

Q. 26. Do you recall the fan blades that were made of steel at that time?

A. I do.

Q. 27. What was their color?

A. As I remember it, they came to the factory packed in boxes, were very greasy when they came there and had to be cleaned and properly prepared for assembling.

Q. 28. Were they bright or were they dark?

A. I don't remember.

Q. 29. Were they punched for rivets?

A. I would not say whether they were punched when they came in or whether they were punched at our factory.

Q. 30. In the assembled fans how were the blades attached to the centre spiders?

A. By rivets while I was there.

Q. 31. By any other methods as far as you know?

A. Not that I know of.

Q. 32. Do you recall whether in any cases heads of the rivets were countersunk on the face of the blades?

A. It seems to me that during the latter part of my employment there the blades were countersunk and a flush rivet was inserted and the head was riveted on the back side of the spider; that is the way it seemed to me.

Direct examination closed.

Cross Examination.

By Mr. CHURCH.

X-Q. 33. You had nothing to do with the manufacture of the fans, did you, that is to say, the putting of the blades and the spider together?

A. No, sir.

X-Q. 34. The strips of steel from which the steel blades were made came in long strips, didn't they?

A. As I remember, the fan blades were shipped into the factory and I don't remember ever seeing any punching and I was at the punching machine every day to get my discs for the armatures while I was there.

X-Q. 35. Your idea is, then, that the blades themselves were brought in complete into the factory?

A. No, sir; just each blade, and the blade was riveted on the spider at the Warren factory and assembled there.

X-Q. 36. Your particular job was what?

A. While in the fan department, building armatures.

X-Q. 37. What did you do in the building of armatures?

A. We had a form in which we placed our shaft and riveted a washer on one end of the shaft and the small segments were wound on this shaft. After we got the required amount of segments on, there was another washer riveted on the other end and then filed and were ready for the winding of the arm.

×-Q. 38. You had nothing to do with the building of the welder, had you?

A. No, sir.

×-Q. 39. Nor with the operation?

A. No, sir.

×-Q. 40. And you never did operate it?

A. I never did.

×-Q. 41. How many months in a year were you employed in the fan department of the Warren Electric and Specialty Company?

A. Well, I could not say; that is too long to remember.

×-Q. 42. Well, you were not employed the whole time?

A. As I remember it, I was employed the greater part of the three seasons that I was there, during 1901, 1902 and 1903. There was a time or two when the business was slack and I was let out because there was no work.

×-Q. 43. That is to say you were employed during the fan seasons of these years?

A. Yes, sir.

×-Q. 44. And the fan seasons did not extend throughout the whole year. How long was the fan season?

A. I don't remember.

×-Q. 45. More than two or three months?

A. Yes, sir; I was there longer than that.

Signature and certificate waived.

Adjourned to further notice.

BOSTON, MASS., July 3, 1919.

Met pursuant to agreement of counsel.

*Deposition of Clifton V. Edwards.*

CLIFTON V. EDWARDS, having been duly sworn, deposes and says as follows:—

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation.

A. Clifton V. Edwards; forty-seven years; residence, New York City; occupation, lawyer.

Q. 2. What, if anything, did you have to do with the suit of the Thomson Electric Welding Co. et al. v. Barney & Berry, which suit

was brought on the Harmatta patent here in suit and tried in the United States District Court for the District of Massachusetts?

A. My firm, Edwards, Sager & Wooster, was retained by the Toledo Electric Welder Company, a manufacturer of the machine used by the defendant, to defend the case and I had charge of the defense.

Q. 3. Did you personally conduct the defense in the trial before Judge Dodge?

A. I did.

Q. 4. Did you argue the case for the defendant in the various hearings which were held in the District Court and in the Court of Appeals?

A. Yes; I had charge of the case from the beginning, passed upon the evidence to be used in the trial, conducted the trial of the case before Judge Dodge, argued it before Judge Dodge and in association with my partner, Mr. Sager, argued it in the Court of Appeals and also supervised the preparation of all motions and other actions on behalf of the defendant in the case.

Q. 5. What did you do in connection with the briefs for the defendant in that case?

A. I wrote personally a large part, if not the main part, of all of the briefs with the assistance of Mr. Sager, who participated in all of them.

Q. 6. Were briefs filed for the defendant in the District Court and in the Court of Appeals?

A. Yes, in both courts.

Q. 7. Do you know Fred P. McBerty?

A. Yes; I met him in connection with the Barney & Berry case.

Q. 8. Mr. McBerty has testified for the defendant in the case at bar and has intimated that the defense in the Barney & Berry case was not conducted as vigorously as possible and that there was some collusion between the plaintiffs in that case and the Toledo Electric Welder Company, which had undertaken the defense. Will you please state the facts as to these matters and the circumstances relating thereto?

Mr. CHURCH. Objected to as incompetent and as calling for hearsay testimony, the witness not having been shown to have any per-

sonal knowledge of any arrangement between his client and the plaintiff in the Barney & Berry case.

A. I am very certain that there was absolutely no collusion in that case. Before the Barney & Berry suit was brought we had defended another suit for the Toledo Electric Welder Company brought against that company by the Thomson Company; that case was the Thomson Electric Welder Company or Thomson Electric Welding Company against the North & Judd Manufacturing Company and I believe the Toledo Electric Welder Company was a nominal party also in the District of Connecticut. During the litigation and when the litigation on the Harmatta patent was threatened Mr. Warren, the principal stockholder and active head of the Toledo Electric Welder Company, took me into his confidence as to the financial status of his company and consulted me frequently from time to time as to the best terms to be made by his company from the business standpoint of extending his business and the financial situation as regarding his ability to stand the litigation, and I believe that I was very closely in touch with everything of importance to the defendant that happened throughout the entire period of the litigation on the Harmatta patent. I am certain that neither Mr. Warren nor anybody else ever intimated to me or to anyone on our side of the case that an honest and successful defense was not desired and we were never limited or stinted or questioned as to the money spent on the defense. We made the best defense we could.

Q. 9. Do you recall any negotiations for a settlement of the Barney & Berry case; and, if so, what effect did that have upon the vigor of your defense?

A. Negotiations for a settlement were in the air practically at all times. Mr. Warren, Mr. McBerty and representatives of another welder company, I think the Winfield Company, and another concern, Geuder, Paeschke & Fry, I think that is the name of the concern, met me at various times and expressed the thought that was often expressed to me by Mr. Warren that it would be a good thing for the benefit of the welder industry if a license could be obtained under the Harmatta patent and at various times we tried to bring that about. Every attempt failed because generally the Thomson Company wanted too much in the way of royalty, at least

more than the others thought they were willing to pay. There was never, however, any thought expressed by anyone that it would be desirable or safe to let the Thomson Company achieve a victory before settlement, because we all felt that if that happened the Thomson Company would either keep the field to itself or exact a prohibitive royalty and none of us felt like taking that chance. Certainly the possibility of a settlement never in the slightest degree diminished our effort to defeat the patent in the trial of the case. We did hope that a trial could be avoided, but never for a moment allowed that thought to interfere with our preparation of the defense.

Q. 10. When you tried the Barney & Berry case, had you heard of an alleged prior use by Fred P. McBerty? And, if so, please state the circumstances.

A. Yes, I heard of it and had it investigated. It came to my attention first from correspondence from Mr. Warren to the effect that Mr. McBerty suggested our getting in touch with his lawyer, Mr. McGill. I saw Mr. Gill, who said he had examined into the matter but did not feel like telling us about it unless expressly authorized by his client; such authorization was subsequently given and Mr. McGill came into my office just as he was leaving for Europe and left with me some statements by proposed witnesses and I think with them was a sample fan blade. After some correspondence I think Mr. McBerty came into the office and I discussed the matter with him and arranged with him to have Mr. Thomas Howe, at that time employed by my firm, go to Warren and wherever else necessary to investigate the proposed defense, to interview proposed witnesses, secure affidavits from them and also to find, if possible, some record evidence to substantiate Mr. McBerty's statements as to the welding of the fan blade. Mr. Howe went to Ohio and after some days returned and delivered to me a number of affidavits and some records and a fan blade which I am quite sure is the same fan blade that was given to me by Mr. McGill and turned over to Mr. Howe. I read the affidavits, talked the matter over with Mr. Warren, also with Mr. McBerty, Mr. Sager and Mr. Howe, and concluded not to press the alleged defense in the trial of the case.

Q. 11. In your interview with Mr. McBerty to what extent did

he tell you he had practiced spot welding at the time in question covered by the affidavits?

Mr. CHURCH. Objected to as calling for hearsay testimony.

A. He said that he or someone associated with him had on one occasion manipulated a butt welding machine by inserting copper rod terminals in the jaws of the machine and inserting between these terminals a fan blade and a spider for carrying the blades and had welded the blade to the spider in the manner shown in the sample which was subsequently annexed to one of the affidavits prepared by Mr. Howe. This sample was not a complete fan wheel, but only comprised one blade and part of a spider. I think he said that the other three blades of the fan had been welded in similar manner, but at any rate the fan had been cut up and he had only been able to find that one blade. He said that these welded fans had not been put into production because the fan blades and spiders for that season's output had already been punched for rivets and that if they used the welded blade they would have to scrap these fan blades and spiders. He also said that none of them had been sold or put into use and that none had been welded except upon the one occasion referred to. He also said that so far as he knew there were no records to establish the date of the experiment as he called it, the exact nature of it or any subsequent use, and of the records found by Mr. Howe, none related directly to these features.

Q. 12. You state that you decided not to make use of this so-called McBerty defence in the Barney & Berry case; what were your reasons for that conclusion?

Mr. CHURCH. Objected to as irrelevant and immaterial and as not calling for evidence, but mere opinion.

A. First, because after reading the affidavits and after hearing Mr. McBerty's version, neither I nor Mr. Sager nor Mr. Warren believed the story. Second, because it seems to me that even if all that Mr. McBerty said had happened, had actually happened, it was nothing more than an accidental experiment and whatever its nature was it was evidently considered by him to be useless for any practical purpose.

Q. 12a. It appears from the record in the Barney & Berry case that you asked Mr. McBerty whether he had done any spot weld-



ing before the date of the Harmatta application and that on objection he was not permitted to answer. What was the purpose of your question?

Mr. CHURCH. Objected to as incompetent and immaterial. The question speaks for itself.

A. We made no attempt to set up this defence in our answer because I did not believe that the story would stand cross-examination, but at the trial of the case Mr. McBerty was present and seemed to think that the court ought to know that he claimed to have done the same thing as set out in the Harmatta patent. We were attempting to show that the transition from a butt welder to a spot welder was a natural one and had been adopted in the natural course of business by our client, the Toledo Electric Welder Company; with a view to showing that no inventive act was involved in making the transition I asked Mr. McBerty a question intended to bring out that he had made a similar transition as a matter of course. We sought to have the question allowed, as I recollect it, in order to show the state of the art rather than to set up a public use. The question was disallowed much to the satisfaction of counsel on our side, because we felt that Mr. McBerty had had his opportunity to put on record his claim, and second that it might give us ground in the Court of Appeals for taking exception to the exclusion of evidence intended to show non-invention, even though not set up in the answer.

Cross Examination.

By Mr. CHURCH.

×-Q. 13. What suits beside the Barney & Berry suit and the suit against the North & Judd Manufacturing Company, brought by the Thomson Electric Welding Company and other, did you defend for the Toledo Electric Welder Company?

A. There was one in Brooklyn; I am not sure of the name of the defendant, but I think it was the United States Metal Products Company and I think the patent was one to Rietzel. I think we were consulted about some interferences, but this I do not recall very clearly and there were many threatened suits against customers.

×-Q. 14. The suit against United States Metal Products Company to which you referred was entitled the Thomson Electric

Welding Company and the Universal Electric Welding Company, plaintiffs, against the United States Metal Products Company, defendants, in equity No. 11, and was brought in the United States District Court for the Eastern District of New York, was it not?

A. That is no doubt the case.

×-Q. 15. A copy of the bill, answer and replication in that suit has been offered in evidence as Exhibit No. 48, and from the bill of complaint it appears that the Toledo Electric Welder Company was invited to come in and be made a party defendant; do you recall that fact?

A. No, I do not recall that fact. I have no present recollection of this, but I note that seems to be the case in the copy of the bill you showed me.

×-Q. 16. It appears from the copy of the bill as shown you that the same was verified on the 20th of March, 1912. It also appears from this record that the answer was filed bearing the name of your firm, Edwards, Sager & Wooster, as solicitors for defendant, and that a general replication was filed by Henry C. Townsend, solicitor for complainant. Will you state whether this cause ever came to hearing; and, if not, why not?

A. The cause never went to hearing. I do not know of any reason why it did not go to hearing, except that the complainant did not bring it to hearing.

×-Q. 17. It appears from the record of the trial of the Barney & Berry suit that the machine whose use was charged to be an infringement of the Rietzel patent in the suit against the United States Metal Products Company practiced spot welding, such as was practiced by the defendant by the use of a similar machine in the Barney & Berry suit. Does this accord with your recollection?

A. I am not sure about that, but my present recollection is that the machine in the United States Metal Products case was a machine that spot welded by striking up the metal to be welded. I think the plaintiff called it projection welding; while the machine in the Barney & Berry case did not operate upon struck up metal, but practiced spot welding by electrodes having an area substantially the same size as the area of the weld to be made.

×-Q. 18. What were the articles made by the United States Metal Products Company?

A. That I do not recall.

X-Q. 19. You mean, do you not, that the specific application of electric welding shown in the Rietzel patent involved the striking up of the metal so as to form projections and the welding of the projections, while the application of electric welding shown in the Harmatta patent involved in the Barney & Berry suit was the welding at spots of plane faced plates?

A. At this time I would not undertake to say what was involved in respect to patents, but, as I understand, your statement seems substantially correct in this, that in the United States Metal Products case, as I recall it, the defendant struck up the metal in points in the places where the weld was desired, the welds being what I would call spots at least in that they were small areas and the welding was accomplished by putting these struck up plates in between the electrodes having areas much larger than the spot or place to be welded, while in the Barney & Berry case the plates were flat plates having no projections and the electrodes were copper points or pencils having small contact areas which pressed against the flat plates and made a weld of substantially the same area as the surface of the electrodes. They both made isolated welded points or spaces or areas of contact.

X-Q. 20. Let me see if a few references to the Barney & Berry record may refresh your recollection. When Mr. Frank Warren was on the stand as witness for the defendant in that suit he was asked by you the following question:—

"Int. 40. And again, in 1911, was one of your customers sued by the Thomson Electric Welding Company and the Universal Electric Welding Company?

"Mr. FISH. That is the same objection, your Honor; it has nothing to do with spot welding.

"Mr. EDWARDS. This has to do with spot welding. This is a spot welding suit, this particular patent I am coming to now.

"The COURT. On the statement that it has to do with welding you may go on.

"Ans. We were sued by them; that is, the United States Metal Products Company were sued by them.

"Mr. FISH. By whom?"

"The WITNESS. By the Thomson Company and the Universal Company, under the Rietzel patent, and that suit was filed March 12, 1912.

"The COURT. One moment. Your question did not call upon you to give any particulars regarding it.

"Int. 41. You can just say 'yes' to shorten the matter.

"Ans. Yes.

"Int. 42. Was not the suit referred to one brought in the United States District Court for the Eastern District of New York by the Thomson Electric Welding Company and the Universal Electric Welding Company, plaintiffs, against the United States Metal Products Company, upon Rietzel patent No. 928,701?"

"Ans. Yes.

"Int. 43. And the United States Metal Products Company was a user of one of the Toledo Electric Welding machines, was it?"

"Ans. Yes, sir.

"Int. 44. Can you point out in one of these bulletins or describe to the court the character of the machines used by the United States Metal Products Company?"

"Ans. I can.

"Mr. STACKPOLE. We object to this, your Honor: it has nothing to do with the Harmatta patent.

"Mr. EDWARDS. Now, I offer in evidence a copy of the Rietzel patent No. 928,701, upon which such suit was based. The same is marked 'Defendant's Exhibit L'."

Then follows this:

"Mr. FISH. Do I understand any welding machine can be used for an indefinite number of electric welding processes? Now, the specific process of Rietzel was one thing. The Rietzel patent had some generic claims that might be construed as for a generic invention back of both those processes. Those claims of Rietzel were practically eliminated from consideration by the result of the interference by which the Harmatta process is entitled to those claims if anyone is. Now, I suppose the specific question that is under consideration—I should have no doubt that the specific process that we claim here as an infringement of the Harmatta patent was

the specific process and the same process as that used by the defendant in the suit that was brought on the Rietzel patent.

"Mr. EDWARDS. If you concede that, why not concede the additional fact that they were performed by substantially the same machine?"

"Mr. FISH. Well, I don't know the machine; I don't care anything about the machine.

"Mr. EDWARDS. Why not let us show that? It would be answered in a very simple question.

"The COURT. Upon the admission of the plaintiff I think I will exclude evidence calling for a description of the machine.

"Mr. EDWARDS. I respectfully except.

"*Int.* 45. Was the machine used by the United States Metal Products for performing the process charged as an infringement in the United States Metal Products case substantially the same kind of machine as is used by the Barney & Berry Company in the present case?"

"Mr. FISH. I think it is.

"*Ans.* Yes."

Does what I have thus read refresh your recollection as to the machine used by the defendant in the Barney & Berry suit being the same as the machine used by the defendant in the case of the United States Metal Products Company?

A. That accords with my present recollection, as stated above. It was our contention at the trial that the Harmatta claims were broad enough to cover the use of both forms of machines, and we sought to show the specific character of the Brooklyn machine.

X-Q. 21. Are you prepared to affirmatively state that the Toledo electric spot welding machine used by the United States Metal Products Company was not used by that company prior to the bringing of that suit against it for the electric spot welding of plates or parts that had no pre-formed projections at the points of welding?

A. At this late date I would not of course be prepared to say what the United States Metal Products Company did, but to the best of my recollection the only use by the United States Metal Products Company that I knew of was the projection welding as above stated.

X-Q. 22. Was any other user of a Toledo spot welding machine

employed to weld plane faced plates or parts at spots ever threatened under the Rietzel patent?

A. I would not say that any of such users were threatened under the Rietzel patent. I have no present recollection that any users of Toledo machines welding upon flat plates was threatened under the Rietzel patent.

×-Q. 23. Were any other suits besides the ones that have been named brought under the Rietzel patent and defended by you?

A. No; I think the United States Metal Products suit was the only suit brought under the Rietzel patent.

×-Q. 24. When you were called upon to defend the suit against the United States Metal Products Company did you know of the previous suit that had been brought by the Thomson Electric Welding Company and the Universal Electric Welding Company against the National Enameling & Stamping Company in the Circuit Court of the United States for the Southern District of New York upon the Rietzel patent No. 928,701, dated July 20, 1909?

A. At this moment I have only a vague recollection that we did hear of some such litigation, and very likely we did.

×-Q. 25. Refreshing your recollection by examination of the answer of the defendant in that case and the answer filed by you in the Metal Products case, don't you think you got your materials for the defense largely from the answer in the first named case?

A. I could not say as to that, but if you will let me look at the answer referred to that may help my recollection. A cursory examination of the printed copies of the answer that you show me indicates that apparently everything that was set up in the National Enameling Company's case was reasserted in the answer in the United States Metal Products case. Perhaps further examination might show something in the United States Metal Products case not in the National Enameling & Stamping Company's case, but I have no doubt after looking at these answers that we knew of the National Enameling case and availed ourselves fully of everything set up in the answer of that case in preparing our answer in the United States Metal Products case.

×-Q. 26. Did you take any part in the defense of or in the gathering of materials for the defense of the suit brought against the National Enameling & Stamping Company?

A. I think not, but I also have an indistinct recollection that I saw either Mr. Untermeyer or someone connected with the defendant's counsel in the National Enameling case and it is not impossible that we may have handed to them some of the material set up in their answer. I have no doubt that we would have been glad to have given them anything that we had that might help them.

*Redirect Examination by Mr. STACKPOLE.*

RDQ. 27. You specialize in Patent Law, do you not, Mr. Edwards?

A. Yes.

Signature and certificate waived.

Adjourned to the same place at 11 A. M., Monday, July 7th.

*Deposition of Thomas Howe, Esq.*

BOSTON, MASS., July 7, 1919.

Met pursuant to agreement of counsel.

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation?

A. Thomas Howe; forty-three years old; White Plains, New York; occupation, patent attorney.

Q. 2. Were you ever associated with the firm of Edwards, Sager & Wooster, of New York?

A. I was.

Q. 3. During what years?

A. From November, 1908, until January 1, 1914. I don't remember the day in November.

Q. 4. While you were associated with Edwards, Sager & Wooster, did you have anything to do with a suit brought by the Thomson Electric Welding Company against Barney & Berry on the Har-matta patent?

A. Yes, I did.

Q. 5. Do you know Fred P. McBerty?

A. Yes, I do.

Q. 6. Did you meet Mr. McBerty in connection with your work on the suit of the Thomson Company v. Barney & Berry? And, if so, state the circumstances.

A. As I said before, I was employed in the office of Edwards, Sager & Wooster, and in the summer of 1913 Mr. Edwards advised me of this suit of the Thomson Company against the Barney & Berry Company, and it seemed to me that Mr. McBerty's company, namely, the National Electric Welder Company of Warren, Ohio, would be interested to see the Barney & Berry Company successful in the suit on the Harmatta patent; that he, Mr. Edwards, would like to have me go out to Warren, Ohio, and that Mr. McBerty would aid me in every way possible to obtain evidence of a use of spot welding which was said to have been made before the Harmatta invention. It was in connection with this matter that I was introduced to McBerty in the office of Edwards, Sager & Wooster, of New York.

Q. 7. What, if anything, did you do towards obtaining evidence of the alleged prior use referred to in your last answer?

A. Mr. Edwards gave to me some sort of a written statement which, as I understood, had been obtained by Mr. McBerty from persons who were thought to have some knowledge of the early use of spot welding by Mr. McBerty and it seems to me there were one or two articles, one of which it seems to me was some sort of a sample of welding work, which had been given to Mr. Edwards as I understood it, and with all of the matters which were in the trial of this case in the office of Edwards, Sager & Wooster and all other things of which I had a knowledge in connection with this matter I took with me and went out to Warren, Ohio, to see Mr. McBerty and such people as he might take me to to obtain information regarding his further use of spot welding. I knew none of the people that I was to see and as I understood it Mr. McBerty was going to do everything that he could to aid in defeating the Harmatta patent, because if the Thomson Company should be successful in its suit against the Barney & Berry Company it was thought that it would very materially interfere with his company, that is the National Electric Welder Company, and I was given to understand by Mr. Edwards that Mr. McBerty would do everything in his power to establish this early use of spot welding by him and was assured by Mr. McBerty that he would do so, and apparently he did do so. I made my headquarters while in Warren in Mr. McBerty's office.

I prepared all of the affidavits which I found it necessary to pre-



pare in his office, and he gave up a great part of his time, in fact I might say all of his time, while I was in Warren to taking me around town introducing me to various people who might know something of his spot welding, and he also took me to Detroit to see a Mr. Brown and a Mr. Lipps. Mr. McBerty took me about by himself considerably, and I recall that he would get his friend, Mr. Newton A. Wolcott of the Packard Electric Company, to take Mr. McBerty and myself in Mr. Wolcott's car to see anybody that it was thought would know anything about the matter under investigation. I also recall going out into the country for a considerable distance with Mr. McBerty to see a man by the name of McDonald, who had gone out on a farm to live and who Mr. McBerty thought might know something about the matter. I recall that altogether we canvassed this matter thoroughly from top to bottom, seeing everyone who was suggested might perhaps know anything about the situation and getting the affidavits of those who apparently did not know very much about the matter so as to have a record of who did know anything about it. I recall that, when we went to see Mr. McDonald, Mr. McBerty thought that probably he wouldn't know very much about it, but to make sure that nothing should be overlooked I said that it would be better to go and find out what he did know. Mr. McBerty proved to be right in that instance because Mr. McDonald did not seem to have much recollection in regard to the early welding, and there being no notary out in the country where he was located I wrote out a statement for him to execute when he should come to town and Mr. McBerty was to forward this to me. This, however, was not done. Mr. McBerty also took me to the Enterprise Electric Company and introduced me to the people there; also to the Peerless Company and numerous other places and did everything possible so far as I could see to give me all the information that he could and to put me in touch with all sorts of information that he could. I understood my errand to be to get everything that could possibly be found in relation to this early welding in the concrete form of affidavits so that I could present them to Mr. Edwards and he could thereupon form his judgment concerning the matter in relation to the Barney & Berry case. I did this to the utmost of my ability and omitted nothing that seemed to me by any possibility could have any bearing on the

situation, and Mr. McBerty gave me to understand that he apparently did put me in possession with everything he knew about. I was somewhat concerned in the case because almost everything seemed to depend upon recollection of the persons who knew anything about the matter, and I was therefore especially urgent to get some documentary evidence or contemporaneously dated articles of some kind which would corroborate the recollection of the witnesses. Such material seemed very scarce and I again and again urged it upon Mr. McBerty that it would be of very great assistance if some such contemporaneous material could be obtained. We scanned the situation again and again and apparently Mr. McBerty did everything that was possible for him to do to produce all the tangible date evidence that he could.

Q. 8. Did you at that time obtain an affidavit from Mr. McBerty himself concerning this early welding?

A. I did.

Q. 9. Were you present at the recent hearing in Detroit before Judge Killits?

A. I was.

Q. 10. Mr. McBerty there testified, and during his cross-examination was shown an affidavit dated October 9, 1913, which he identified. What, if anything, did you have to do with the preparation of that affidavit?

A. With Mr. McBerty's assistance, I prepared it.

Q. 11. Mr. McBerty in his testimony stated that he in 1901 spot welded a number of complete fan blades and spiders, and that such spot welded fan blades and spiders went through the factory and were put into the regular fans. What, if anything, did Mr. McBerty tell you in 1913 about the spot welding of complete fan blades and spiders?

A. He said that they had made one fan, one complete structure, — by a complete structure I mean the central part which has been referred to as spider with a blade secured to each of the arms of the spider. In this connection I was very insistent to learn if more of these fan blade structures had not been made, and especially I was desirous of establishing that there had been some commercial use made of these fan structures because I believe this would have made our case of prior use immeasurably stronger.

but I was unable to find out by McBerty or anyone that there had been a commercial use of them, in fact was told there was no commercial use; the reason was that Mr. Gillmer had decided not to put them into commercial use because of financial considerations, and that ended the matter.

Mr. CHURCH. All that part of the answer beginning with the sentence "In this connection" and continuing on to the end is objected to as not responsive to the question, as incompetent and hearsay, and, if it is intended as a contradiction of any testimony given by Mr. McBerty or any other witness for the defendant while on the stand, as incompetent, no proper foundation having been made during the examination of Mr. McBerty for such contradictions.

Q. 12. Mr. McBerty testified that a fan with spot welded blades and spider was photographed, a cut made from the photograph and reproduced in a catalogue of the Warren Electric and Specialty Company for the season of 1901. What, if anything, of these circumstances did Mr. McBerty tell you in 1913?

A. He said nothing of the things which you mentioned. In fact he did not tell me that a complete fan structure, that is including the motor, fan, guard, etc., and including spot welded blades, had been built around that time, or in fact at any time.

Mr. CHURCH. All of the answer included in the last sentence beginning with the words "In fact" are objected to as irresponsible and as containing the volunteered testimony of a swift witness and therefore incompetent, irrelevant and immaterial.

Q. 13. At the hearing before Judge Killits affidavits of Mr. Lipps and a Mr. Gilder were introduced during their respective cross-examinations; did you prepare those affidavits?

A. Yes.

Q. 14. While you were investigating this prior use with Mr. McBerty did he take you to see a man by the name of William Smith or William E. Smith?

A. He did not.

Q. 15. Did he suggest your seeing such a Mr. Smith in connection with this alleged prior use?

A. He did not.

Q. 16. In connection with this alleged prior use did you go to see a Mr. Edward Craft or Crafts?

A. I did.

Q. 17. What did Mr. Craft tell you about this matter?

Mr. CHURCH. Objected to as calling for hearsay testimony and, if not, as incompetent if intended to contradict anything testified to by Mr. Craft while on the stand as witness for the defendant, no proper foundation having been laid for such contradiction.

A. After I returned from Warren and Detroit I went to see Mr. Craft at the office of the Western Electric Company in New York. Mr. Craft said that it had been a good many years ago and that he did not recollect the matter very much so that he did not care to give me an affidavit.

Q. 18. Did you obtain an affidavit from Mr. Craft?

A. I did not.

Q. 19. While you were investigating this matter with McBerty in Warren in 1913 did he show you the welding device on which this welding was said to have been done?

A. He showed me a structure which he said was the welding device of his early use, but it was not complete at the time I saw it.

Q. 20. In what way was it not complete?

A. So far as spot welding was concerned, it had no points and clamps with which to do spot welding and Mr. McBerty said that the transformer was not in shape to operate. It lacked some other parts which I do not now recall definitely.

Q. 21. Did Mr. McBerty show you the transformer that went with this welder?

A. I cannot recollect seeing the transformer.

Q. 22. Was the welding device mounted as it was mounted at the hearing before Judge Killits?

A. No, it was not.

Q. 23. Did McBerty do any welding for you with this welding device?

A. He did not.

Q. 24. I show you a number of papers, all of which have the caption "In the United States District Court, District of Massachusetts, Thomson Electric Welding Co. et al. v. Barney & Berry Inc.", which purport to be affidavits of the following persons:

Frank G. Brown, Austin C. Pendelton, Rolland F. Pfile, Milton W. Betchel, Charles B. McCurdy, Oscar P. Pilz, Newton A. Wolcott, Walter T. Wakefield, David R. Estabrook, Robert W. Bean, Alton J. Lewis, Robert J. Meenely, Edward Bettiker, Alfred Ulp. Please state whether you recognize these papers; and, if so, as what.

A. Yes, I recognize these as affidavits secured by me on my trip to Warren and Detroit in the fall of 1913. These affidavits were prepared by me.

Q. 25. Are these the affidavits or some of them concerning which you have testified?

A. They are.

(The affidavits are offered in evidence by the plaintiff, and the same are marked "Plaintiff's Exhibit No. 33, Affidavits of Messrs. Brown, Pendleton, Pfile, Betchel, McCurdy, Pilz, Wolcott, Wakefield, Estabrook, Bean, Lewis, Meenely, Bettiker and Ulp obtained by Mr. Howe".)

Mr. CHURCH. The affidavits offered are objected to as incompetent, irrelevant and immaterial and as hearsay, the affiants for ought that appears being available as witnesses in this case.

Q. 26. Were these affidavits marked "Exhibit No. 33" obtained with Mr. Berty's assistance and knowledge?

A. They were. He was present, I think, in every instance when I talked over the matter and knew of the affidavits which they executed.

Q. 27. Are these affidavits marked "Exhibit No. 33" and the affidavits of Messrs. McBerty, Lipps and Gilder, already introduced in evidence, all the affidavits obtained by you in connection with this McBerty use?

A. I believe so; I don't recollect anyone else; the affidavits were all turned in and kept together.

Q. 28. After you had collected all the affidavits and the information concerning this McBerty use what did you do with them?

A. Put them in the file of the case at the office of Messrs. Edwards, Sager & Wooster after showing them to Mr. Edwards.

No cross-examination.

Signature and certificate waived.

*Deposition of Wilbur F. Turner.*

## Direct Examination.

By Mr. STACKPOLE.

Q. 1. Please state your name, age, residence and occupation.

A. Wilbur F. Turner; 10 Scotland Road, Reading; business, expert and commercial photographer; age, fifty-nine years.

Q. 2. How long have you been practicing your present profession?

A. Thirty years.

Q. 3. I show you a cut of a desk fan, namely, Fig. 36, Peerless, enclosed field fan motor, which appears at the lower right-hand corner of page 163 of the April, 1901, number of the American Electrician, and also a photograph of a cut marked "G-2" which is a reproduction of page 17 of the catalogue of the Warren Electric and Specialty Company for the year 1901. These cuts are said to be identical. From your knowledge of commercial photography can you state the process by which these cuts were made?

A. I can.

Q. 4. Please do so.

A. These cuts were produced from photographs taken from the original fan, then retouched with the air brush and half-tone cuts made from them.

Q. 5. What is the process of retouching with the air brush?

A. An air brush sprays on the liquid color, giving a nice even surface,—the object of that is to smooth up the surface so that it will reproduce smooth and brilliant,—then in each drawing the lines are brought up with a pen or a fine-pointed brush. In this process it is possible to eliminate anything in the drawing or photograph that is not wanted to show in the original cut.

Q. 6. I show you here a fan with a centre and four blades attached thereto with rivets. Did you at my request make a photograph of that fan?

A. I did.

Q. 7. Please produce the photograph.

A. I here produce the photo.

(The photograph produced by the witness is marked "Plaintiff's Exhibit No. 34, Turner Photograph of Riveted Fan"; and the fan centre and rivet blades identified by the witness are offered in evidence as "Plaintiff's Exhibit No. 35, Fan Spider with Riveted Blade".)

Mr. CHURCH. Objected to as irrelevant, immaterial and incompetent.

Q. 8. After you had taken this photograph, what was the next step that was done to cause the production of a cut of this fan?

A. The photograph was retouched and lined up and a half-tone cut made of it.

Q. 9. How was the photograph retouched?

A. With the air brush and fine pointed brush and some pen work.

Q. 10. What was the effect of the retouching on the showing of the rivet heads shown in Plaintiff's Exhibit No. 34?

A. That removed the rivet heads.

Q. 11. Please state whether or not such result would ordinarily occur in retouching such exhibit as No. 34.

A. It would.

Q. 12. Have you the retouched photograph? And, if so, please produce it.

A. I have.

(The retouched photograph is offered in evidence and marked "Plaintiff's Exhibit No. 36, Turner Retouched Photograph of Riveted Fan".)

Q. 13. Can you produce the cut made from the retouched photograph?

A. I can.

(The cut produced by the witness is offered in evidence and marked "Plaintiff's Exhibit No. 37, Cut of Retouched Photograph of Riveted Fan".)

Q. 14. In case it was desired to show the rivet heads in the final cut, how would that be done?

A. With a small brush.

Q. 15. Can you state from your knowledge of commercial pho-

tography whether the same process which you employed to produce Plaintiff's Exhibit No. 37 was employed to produce the cut of figure 36 of the April, 1901, number of American Electrician and the cut of the G-2 fan above referred to?

A. Yes, the same process all the way through.

Q. 16. Was that process in common use in 1901?

A. Yes, sir.

Q. 17. If the original fan in which the cut in the American Electrician and the cut of the G-2 fan above referred to had rivet heads on the fan blades as in Plaintiff's Exhibit No. 35, would those rivet heads show in the final cut?

A. No, not in this case; those [*pointing to the cut in the American Electrician and the cut of the G-2 fan*] have been covered and sprayed, as in the cut made by me.

Q. 18. Please read on the record the name plate on the motor part of the fan of which you made the photograph.

A. "Peerless direct current fan motors, volts 240 amp. .4 type, G-2 No. 4454. Peerless Electric Company, Warren, Ohio."

No cross-examination.

Deposition closed.

Signature and certificate waived.

(Plaintiff's counsel states that he has received from Mr. L. C. Brewer the two photographs which Mr. Brewer stated were given him by Mr. William E. Smith and these photographs are marked with the name "L. C. Brewer". They are offered in evidence and marked, respectively, as "Plaintiff's Exhibit No. 38, Photograph No. 1, shown to Brewer by Wm. E. Smith", and "Plaintiff's Exhibit No. 39, Photograph No 2, shown to Brewer by Wm. E. Smith".)

Adjourned.



WARREN, OHIO, July 10, 1919, 11.30 A. M.

Met pursuant to agreement of counsel.

Present: J. L. STACKPOLE, Esq., Counsel for Plaintiff;

A. S. PATTISON, Esq., Counsel for Defendant.

Depositions taken on behalf of the plaintiff under the Equity Rules of the Supreme Court of the United States and under the Revised Statutes. Before me,

W. S. HELSLEY,

*Notary Public and Special Examiner.*

*Deposition of Charles G. Wolfe.*

CHARLES G. WOLFE, being by me first duly sworn to tell the truth, the whole truth and nothing but the truth, deposes and says as follows: —

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Your age?

A. Forty-one.

Q. 2. Your residence?

A. 37 South Linden Avenue, Warren, Ohio.

Q. 3. Your occupation?

A. Carpenter and contractor.

Q. 4. Were you ever employed by the Warren Electric and Specialty Company of Warren, Ohio?

A. Yes, sir.

Q. 5. Do you recall in what years?

A. I think I started there in January, about the latter part of January, in 1900.

Q. 6. And worked there how long?

A. Well, I quit or was laid off and went back several times. In all I suppose there would be in the neighborhood of two years.

Q. 7. Do you recall an electric welding machine that was used at the plant of the Warren Electric and Specialty Company for welding fan guard rings?

A. Yes, sir.

Q. 8. Did you have anything to do with making that machine?

A. Inasmuch as I helped Mr. McBerty.

Q. 9. Helped Mr. McBerty do what?

A. To place the machine and make a few little changes on there which I don't know just exactly what they are now, not being interested in the case.

Q. 10. Did you assist Mr. McBerty in mounting it upon the bench and getting it started?

A. I don't know just how to fix that. I did in a way, inasmuch as a kind of helper in the case.

Q. 11. What was your regular job at that time?

A. Assembling fan motors.

Q. 12. I show you a picture of a device purporting to represent an electric welding machine, which is marked "Plaintiff's Exhibit No. 39". Did you recognize any part of this device?

A. I recognize the top part of it there as being original.

Q. 13. Do you recognize any part as being original?

A. I don't remember of the projecting out that far from the bench and I don't remember of the angle irons, — or is that wood or irons in under there?

Q. 14. The angle irons under the arms.

A. The vision I had of that machine it set on fibre flush, or nearly flush, with the bench.

Q. 15. You mean by that a fibre plate?

A. Yes, something; I don't have an idea of it projecting over an inch if it did that.

Q. 16. Was there an opportunity to stick a fan blade or sheet of steel down between the jaws of the welder when it rested on the fibre?

A. Not that I remember. Maybe I can cover it a little bit better by using my own language. What I remember about this machine is that we — it seems as though we laid the rings around on the bench, would go around this way, horizontally, and brought the points together; in fact that is pretty nearly all I remember about it.

Q. 17. Do you recall whether or not at first they got enough current to make good welds?

A. It seems as though at first they broke, that is the metal didn't unite, and at about that time I was grinding what you would call — where they pressed the iron together would leave kind of little ball on there and we would take them to the emery wheel and grind them down. At first there was quite a number of them would

break in the joint. I think afterwards though they got them so it would hold; they didn't have so much loss on them.

Q. 18. Do you recall any spot welding of metal sheets together with this machine?

A. I don't remember it.

Q. 19. Do you recall hearing of any at that time?

A. Not that I can bring back to mind now; in fact, all that I knew about it was the ring welding.

No cross-examination.

*Deposition of Louis L. Little.*

LOUIS L. LITTLE, who was next called as a witness and being first duly sworn to tell the truth, the whole truth and nothing but the truth, deposes and says as follows: —

Direct Examination.

By Mr. STACKPOLE.

Q. 1. What is your name?

A. Louis L. Little.

Q. 2. Your age?

A. Fifty-one.

Q. 3. Occupation?

A. Machinist.

Q. 4. Where are you now employed?

A. Peerless Motor Car Company, Cleveland.

Q. 5. Where is your residence?

A. 6615 Belvidere Avenue, Cleveland.

Q. 6. Were you ever employed by the Warren Electric and Specialty Company?

A. Yes, sir.

Q. 7. About how many years ago?

A. About 1901.

Q. 8. Do you recall an electric welding machine that was used at the Warren Company for welding fan guard rings?

A. Yes, sir.

Q. 9. Did you do any work on that machine?

A. Yes, sir.

Q. 10. What was it?

A. Making the mechanical parts about clamping and holding the

fan guard in position. Also in locating, doing any mechanical parts they wanted made there, and getting the machine going.

Q. 11. Did you have anything to do with setting the machine up on the bench?

A. Not about setting up; I put the parts on after it was set on the bench.

Q. 12. I show you a photograph of a machine, Plaintiff's Exhibit 39. Do you recognize any parts of this device?

A. Yes, sir.

Q. 13. What parts?

A. The fastenings and the connections are made; looks about like it did when we assembled the machine.

Q. 14. Do you recall the angle irons on the machine?

A. I do not. The guard connections set back on the bench to the best of my recollection.

Q. 15. Was there any slot cut in the bench?

A. No, sir.

Q. 16. Was there any opportunity for insertion of fan blades or such like sheets of metal between the parts of the machine?

A. To the best of my recollection, there was no space to put anything there at all unless it was a very narrow piece.

Q. 17. What kind of welding was done?

A. Butt welding.

Q. 18. Any other kind of welding to your knowledge?

A. Never was used for any other purpose.

Q. 19. Did you ever hear of it being used for any other purpose?

A. Never heard of it being used for any other purpose.

Q. 20. When the machine was first set up did it operate successfully to make good butt welds?

A. No; had trouble with the rings breaking and pulling apart.

Q. 21. Have you ever spoken to Mr. McBerty about this machine?

A. Recalled to his mind that I had worked on the machine when it was constructed.

Q. 22. When did you speak to him about this?

A. I think that was five or six years ago.

Q. 23. Do you recall how the fan blades were fastened to the arms of the spiders?

A. They were all riveted on.

Cross Examination.

By Mr. PATTISON.

×-Q. 24. Your work as machinist at the Warren Electric and Specialty Company was in the machine shop, was it not?

A. Yes, sir.

×-Q. 25. And at the time the welding machine was made the machine shop was in a separate building from the fan shop, was it not?

A. I couldn't just tell you; it wasn't in the same room; I know we had to go from the machine shop into another room where the welder was set up.

×-Q. 26. And your work as machinist was in this separate room?

A. Not altogether. When I made parts for the welder I took them over and put them on the machine.

×-Q. 27. But I mean your general work.

A. General work was in the machine shop.

The signatures and certificates of both witnesses are waived by consent of counsel.

*Deposition of George I. Spade.*

GEORGE I. SPADE, being by me first duly sworn to tell the truth, the whole truth and nothing but the truth, deposes and says as follows:—

Direct Examination.

By Mr. STACKPOLE.

Q. 1. What is your name?

A. George I. Spade.

Q. 2. What is your age?

A. Forty.

Q. 3. Where is your residence?

A. 25 Roosevelt Avenue.

Q. 4. Warren?

A. Yes, sir.

Q. 5. What is your occupation?

A. Mail carrier.

Q. 6. Were you ever employed by the Warren Electric and Specialty Company of Warren, Ohio?

A. Yes, sir.

Q. 7. When?

A. In the spring of 1899 when I started in.

Q. 8. How long did you work there?

A. For at least three years anyhow.

Q. 9. Do you recall an electric welding machine that was used for welding the fan guard rings on desk fans?

A. Yes, sir.

Q. 10. Did you have anything to do with its making?

A. No, sir.

Q. 11. Did you see it in operation?

A. Yes, sir.

Q. 12. What was the nature of your employment?

A. First as an assembler, then I was in charge of the assembling department.

Q. 13. Assembler of what?

A. Motors.

Q. 14. Do you recall the setting up of this electric welding machine?

A. Not the setting up of it, but of seeing it after it was set up.

Q. 15. Did you see it in operation?

A. Yes, sir.

Q. 16. How frequently did you see it?

A. Well, I wouldn't say every day, but I was in the room working every day and would have to be in the same room with it.

Q. 17. I show you a photograph which is Plaintiff's Exhibit No. 39. Does this show the welding machine in question?

A. No, sir, not the machine.

Q. 18. In what respects is the photograph inaccurate?

A. Well, it sets out too far from the bench one thing, and of course this has electrodes when the other did not. The other machine set on a plate, its construction I can't say whether it was steel, wood or what it was, and this I think is bolted to the bench from the looks of it.

Q. 19. Did the welding machine have the angle irons shown in the photograph?

A. No, sir; I have no knowledge of it.

Q. 20. Was it possible to insert blades or steel pieces down between the welding devices as shown in that photograph?

A. Not unless it would have been a very narrow piece, say about one-half inch.

Q. 21. One-half inch deep you mean?

A. Yes, sir.

Q. 22. What kind of welding was done on the machine?

A. Butt welding.

Q. 23. Of what things?

A. Guard rings.

Q. 24. Did you ever see spot welding done on the machine?

A. Never.

Q. 25. Did you ever hear of it being done on the machine?

A. No, sir.

Q. 26. Have you talked about this machine with Mr. McBerty?

A. I have.

Q. 27. When?

A. About two years ago.

Q. 28. Have you talked about this machine with Mr. William E. Smith?

A. We have talked over the subject; yes, sir.

Q. 29. When was that?

A. Several times.

Q. 30. And have you talked about the machine with Mr. Pattison, who is now present?

A. Yes, sir.

Q. 31. When was that?

A. About two years ago at the same time I was talking to Mr. McBerty.

Q. 32. Do you recall the general construction of the cheap fans which were put out with the butt welding fan guard rings?

A. You mean the construction of the blade, or the construction of the whole machine, motor?

Q. 33. Well, do you remember the blades and spiders?

A. Yes, sir.

Q. 34. I show you a blade and spider that is now secured to a fan. Please state whether you recognize the construction of the blade and spider.

A. Yes, sir; I would say that is a reproduction of the original

blade and spider; the brass blades I believe had a straight brass piece up here [*indicating*] where this one is on a triangle.

Q. 35. In this cheap type of fan how were the blades fastened to the spider?

A. Riveted.

Q. 36. About how many rivets?

A. Three rivets.

Q. 37. Arranged as in this example?

A. Yes, sir.

(Plaintiff's counsel offers in evidence the spider and blades riveted thereto and asks that the same be marked "Plaintiff's Exhibit No. 40, Steel Spider and Blades Identified by Mr. Spade".)

Q. 38. Do you recall whether the bench on which this welder was mounted was slotted or cut?

A. No, sir, it was not.

Q. 39. Do you recognize the rest of this apparatus here?

A. Yes, sir.

Q. 40. What is it?

A. It is a direct current motor.

Q. 41. Made by whom?

A. Peerless Electric Company.

Q. 42. Was the Peerless Electric Company the one that was the successor of the Warren Electric and Specialty Company?

A. To the best of my knowledge and belief.

(Plaintiff's counsel offers in evidence the fan on which Exhibit No. 40 is mounted, and the same is marked "Plaintiff's Exhibit No. 41, Fan made by Peerless Electric Company".)

#### Cross Examination.

By Mr. PATTISON.

×-Q. 43. Mr. Spade, I show you a photograph of a page from the 1901 catalogue of the Warren Electric and Specialty Company. "Plaintiff's Exhibit No. 38", and call your attention to the fact that that shows the "G" type of fan and I notice that this appears to be a differently constructed fan. Is not that right?

A. I believe, if I remember right, the G type was a cheaper fan. This motor is not a G type. The motor part, understand.

×-Q. 44. How is the standard?



A. You are going back eighteen years ago and more.

X-Q. 45. You see this don't have any swivel in it ; it is rigid?

A. This is a different motor here than the G type.

X-Q. 46. And it is a different standard?

A. Yes, sir.

X-Q. 47. That is, the standard of the G type as shown in the catalogue is different from that shown in this Exhibit 41?

A. Yes, sir, it was a cheaper fan ; it was got out to be a cheaper fan than this one.

X-Q. 48. This fan Exhibit 40 and 41 was made after that shown on this page of the catalogue?

A. I believe I differ. I believe it was made before.

X-Q. 49. You think that that Exhibit 40 and 41 was made before the G type fan on this page of the catalogue, Plaintiff's Exhibit No. 38?

A. You are combining this blade with this fan. There are two different exhibits there altogether and you are getting me to talk about both of them. This is a G type blade and this is a different motor.

X-Q. 50. Was that motor made before or after G type on this catalogue?

A. To the best of my knowledge, it was made before.

X-Q. 51. Do you know where this fan blade came from?

A. No, sir.

X-Q. 52. Will you please examine carefully the spider of this fan and state whether it is brass or steel?

A. I would say it was a bronze spider for my part.

X-Q. 53. The brass spiders were not used in the G-2 type of fan, were they?

A. No, sir.

X-Q. 54. The spiders of that type G-2 fan were made of steel, were they not?

A. Of steel ; yes, sir.

The signature and certificate of this witness is hereby waived by consent of counsel.

Adjourned to the office of Messrs. Carpenter, Stevenson, Betzel-Bacchus, Ford Building, Detroit, Michigan, Monday, July 14, 10.30 A. M.

Depositions on behalf of plaintiff taken under the Equity Rules of the Circuit Court of the United States and the Revised Statutes, before me,

C. A. STICKLE,  
Notary Public and Special Examiner.

DETROIT, MICH., July 14, 1919, at 10.30 A. M.

Met pursuant to adjournment.

Present: J. L. STACKPOLE, Esq., Counsel for Plaintiff;  
A. S. PATTISON, Esq., Counsel for Defendant.

*Fourth Deposition of James H. Gravell.*

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Are you the same James H. Gravell who has already testified in this case?

A. Yes.

Q. 2. Have you read and do you understand the British patent to Ferranti, No. 11,921 of 1903?

A. Yes.

Q. 2. Please state whether you find the process of spot welding set forth in the Harmatta patent in suit described in the provisional specification of this deFerranti British patent.

A. The process set forth by Harmatta is not anywhere disclosed in deFerranti's provisional specification. DeFerranti describes a number of ways of solving the problem of butt welding the end of a turbine blade to a carrying disc. This condition required the welding of a large surface to a small surface by butt welding the two surfaces together. Owing to the fact that the thermal characteristics of the two parts of the work to be united varied greatly, the heat generated at and near the abutting surfaces was conducted away much more rapidly by the large disc than by the small blade, with the consequence that the disc remained practically cool and would not attain the sufficient heat to create the weld. According to the words of the inventor:

"The invention, therefore, consists broadly in adjusting the volume of the disc in the neighborhood of the welding point so that approximately an equal heating occurs in both faces to be welded."

The inventor then goes on to describe how he will adjust the volume of the metal in the disc. One of the modifications consists in cutting grooves across the edge of the disc or ring; another modification consists in running grooves circumferentially around the disc, or in cutting a number of grooves running in different directions across the edge of the disc. Still other modifications are suggested by the inventor. Radial holes may be bored a short distance into the edge, or holes may be bored near the edge of the disc from one face through to the other face. Still another modification is suggested. The disc may be made laminated so as to produce the same general shape of surface as produced by the circumferentially formed groove in the face of the solid disc.

In the case of cutting the groove entirely across the edge of the disc, the metal of the disc is isolated so as to form projecting portions corresponding to the abutting end of the turbine blade. This method was fairly well understood even at the time of Ferranti's application, and had been used prior to that time by myself. This suggestion of cutting the grooves across the edge of the disc made the problem one of simple butt welding, and practically made the two abutting surfaces of the same thermal characteristics. The idea of the circumferentially cut grooves produced what is now called a cross-wire welding; that is, the length of the blade surface would cross at right angles the length of the disc edge surface. This modification is a form of butt welding of which it possesses the general characteristics. There is a burr formed, and in welding one part of the work is forcibly pushed into the other part of the work. The idea of drilling radial holes in the edge of the disc so modified the disc that, according to the inventor, a more satisfactory butt welding condition could be obtained. In some cases these holes follow the general pattern of the end of the blade so that the actual effect produced was very similar to running grooves across the edge from face to face and produced projections corresponding, in a fashion, to the projecting end of the turbine blade. This same idea was practically produced when the holes were bored through the disc from face to face near the edge.

The idea of running grooves across the edge of the disc from face to face obliquely, and then running another set of grooves obliquely in the other direction so that they would cross the first set of

grooves was another modification suggested by the inventor. This produced practically the same effect as cutting two grooves across the edge of the plate so as to isolate a projecting portion. It had, however, an advantage over the two-groove cuts and can be realized when we consider the shape of the turbine blade. Looking at the end of a turbine blade, it is crescent shaped. It is clear that it would be a very expensive operation to cut crescent-shaped grooves across the face of a turbine disc so that the projecting portion of the disc would exactly correspond to the projecting portion of the blade. By utilizing crossing grooves we can attain a crescent-shaped projection practically corresponding to the crescent shape of the blade; that is, there will be a number of closely related and located projections all contacting with the end of a blade. All the projections which contact with the end of the blade become practically one large projection, electrically and thermally considered, but those projections which do not contact with the blade play no part in the thermal conductivity. In order to produce this effect mentioned by Ferranti, these grooves would necessarily be very narrow, for if they were wide, it would reverse the condition desired by Ferranti, that is, two surfaces of equal thermal characteristics. Ferranti tells us that the proposition of welding a turbine blade to a disc will not work because the two surfaces differ in thermal characteristics; that is, one is a large surface and the other is a small surface. Now, if the grooves are wide, we have slender projections in relation to a big blade, and consequently, according to Ferranti's ideas, no weld would occur. In making the weld with the crossing grooves there is no change in Ferranti's method of operation. It is still a plain, simple butt-welding operation in which there is a burr formed, and in which one part approaches the other during the operation.

We must bear in mind that in all of Ferranti's modifications the same general process of welding is carried out; that is, the parts are held in clamps and the current passed from one part to the other, and when the temperature has sufficiently risen the two parts are forcibly pressed together.

In none of these modifications described by Ferranti is there any suggestion of Harmatta's process, where the product is two bodies united by isolated welds or welds surrounded by unwelded areas.

Q. 4. Please compare the showing of the deFerranti complete specification with the process of the Harmatta patent.

A. In the complete Ferranti specification the modifications suggested by Ferranti in his provisional specification have been more completely described, and sketches are made illustrating the various suggestions he originally made in his provisional specification. Most of these illustrations are such as a man skilled in the art at the time of Ferranti's provisional specification would expect to find them. Figure 2, however, is to my mind an exception. In figure No. 2 of the complete specification Ferranti shows grooves which are very wide, producing a number of very slender projections, so that each projection considered by itself is of tremendously different thermal characteristics than the blade to which it is supposed to weld, and according to Ferranti's own description no weld would happen owing to the great difference in thermal characteristics. I have, myself, experimented with the condition which I would imagine Ferranti meant in his provisional specification, and I found that when the grooves were narrow a single weld was produced across the whole end of the turbine blade, and this weld was reasonably strong. In fact, the blade could be bent without separating it from the surface, but when I endeavored to make welds with spacings great between the projections it was with great difficulty that I secured welds, and even after securing the welds the blades could be separated from the disk by a sharp blow.

MR. PATTISON. The testimony of the witness relating to his experiments above described is objected to because the experiments were not carried on in the presence of the defendant's counsel.

A. In carrying out the experiments the blades were gripped in copper clamps, as likewise were the discs, and the operation was a true butt-welding one. A burr was formed and one part approached the other in the operation. When the grooves are made so that a strong weld is produced, there is a decided tendency for the conducting projections to mushroom and arch from one to the other under the abutting surface of the blade, due to the pressure applied to the softened metal. It is not likely Figure 2 would be, if carried out, exactly as depicted, conducive to practical results, for the amount of area welded would be very small in comparison with a cross-section of the blade. It should be noted that the surface is

much smaller than a casual observation would indicate, for in no case is the entire surface of any one of the projections in contact with the blade, and comparing this with Harmatta's process, even supposing that each projection as indicated in Figure 2 were welded to the blade, in no case would there be an isolated weld surrounded by an unwelded area in the meeting surfaces.

(Adjournment to the office of the Clerk of the United States Court.)

Q. 5. Please examine the 1901 catalogue of the Warren Electric and Specialty Company, Defendant's Exhibit No. 2, and state which, if any, of the pictures of the desk fans illustrated therein show rivet heads on the backs of the spiders or centres.

Mr. PATISON. The question is objected to because the catalogue is the best evidence of the subject-matter of the inquiry.

A. The fan labeled A-4 shows a rivet on the back of the spider, and G-2 shows a rivet on the back of the spider.

Q. 6. Where does the rivet on the back of the spider in the G-2 blade appear in the cut?

A. It appears on the lower blade on the right-hand side facing the cut, directly above where the small central ring of the guard intersects the right-hand edge of the lower blade.

Q. 7. Will you take "Plaintiff's Exhibit No. 40, Spider and Blade Riveted Thereto", and see whether by holding it in the proper position, as shown in the G-2 fan, the rivet head on the back of the spider is visible as shown in the cut of the G-2 fan?

A. Yes; by holding this exhibit in the position occupied by the spider and fans in cut G-2, a rivet on the back of the spider is visible. This rivet occupies the same relative position as the visible rivet in the cut G-2.

Q. 8. How about the rivet shown on the back of the spider in the cut of the A-4 fan? On which blade is that?

A. The visible rivet is on the left-hand edge of the top blade.

Q. 9. And holding the "Plaintiff's Exhibit 40" in the position of the spider and blades shown in cut A-4, can you see the same rivet head?

A. Yes.

Q. 10. Now, examine this 1901 catalogue and state which of the

cuts of the desk fans show the rivet heads so positioned as to be arranged in triangular relation to one another.

A. The following cuts show triangularly arranged rivets, that is, three rivets: cut A-1, A-2, A-3, A-4, E-2, G-1, G-2.

Q. 11. The triangular arrangement of the rivets would indicate what shape of the arm of the spider?

A. A shape very similar to that contained on the fan of "Plaintiff's Exhibit No. 40"; that is, petal-shaped arms on the spiders.

Q. 12. I show you specimen attached to the affidavit of Mr. Lipps, "Plaintiff's Exhibit No. 30", which specimen is marked "Lipps' Exhibit H". Please state whether or not this "Lipps Exhibit H" is spot welded.

A. I would say that this was stuck and not spot welded in the true sense of the term. I say this because I note that the weld at one of the flat edges, although it appears to have been heated more than the other welds, does not seem to have been heated enough because I note that the metal has parted at this weld, and if this weld is only a stick, there is every reason to suppose that all the rest of the welds are only sticks. Therefore, I would not consider this sample really spot welded.

Q. 13. What is the difference between a "stick" and a spot weld?

A. In a stick the metal may be united by a partial fusing of the oxides or a semi-cohesion. In a weld the metal has been brought up to a high temperature and the actual metallic surfaces have intermingled.

Q. 14. I show you McBerty's Exhibit O, attached to McBerty's affidavit, "Plaintiff's Exhibit No. 28". Please state whether the blade of this exhibit is steel or not; and, if so, if it has been treated in any way.

A. Both the blade and section of spider attached thereto are of steel. The blade at one period of its existence has been copper-plated. This is evidenced throughout the surface of the blade, but particularly at one point along the left-hand edge of the back of the blade when the spider is held downwardly. The copper-plating of the blade has been blued.

Q. 15. Can you tell whether or not the blade has been welded to the piece of spider arm before or after the spider arm was cut?

A. Yes, that is very easily told, because I note that the cut

surface of the spider arm is blued. This is evidently caused by the heat soaking back from the spot which has been heated for welding. Had the spider arm been welded to the blade prior to cutting, this surface could not possibly have shown any bluing.

Q. 16. Please give the reasons for this last statement.

A. Metal is blued by oxidizing in the air, and had the blade been welded first and then cut, this surface would not have been exposed to the air while heated to a bluing temperature.

Q. 17. Please examine the blade around the rivet holes and state if you find any indication of the blade once having been riveted.

A. I note concentric marks around the two rivet holes, which indicates clearly that the blade was once riveted and the rivets removed.

Q. 18. Do you find such marks on the spider arm?

A. No, I do not.

Q. 19. Please examine the other specimen attached to McBerty's affidavit, known as McBerty's Exhibit P. Can you tell whether this piece of metal was welded to the piece of spider arm before or after the spider arm was cut?

A. The end of this spider arm also shows bluing, which would indicate that the welding was done after the portion of spider arm had been detached from the main spider.

Q. 20. I show you "Defendant's Exhibit M". What is the metal of the blade of this exhibit, and how has it been treated, if at all?

A. The blade of this exhibit is of steel. It has been copper-plated and then nickel-plated. The coppering shows through the nickel near the top cut edge of the face of the blade, and I note a scratch near the top edge which shows copper beneath the nickel surface.

Q. 21. During your handling of this exhibit in the trial of the case in court, did you scratch it at all?

A. Positively not. I was extremely careful in handling the sample because I was present at the trial when there was some criticism about scratching the sample, and this made me doubly careful.

Q. 22. Does the blade portion of "Defendant's Exhibit M" show signs of rivets around the rivet holes? A. Yes, both the



rivet holes have concentric marks, which surely indicate the presence of rivets at one period of its existence.

Q. 23. Does the spider arm of this exhibit show corresponding rivet marks around the holes?

A. No, it does not.

Q. 24. A part of the spider arm of this "Exhibit M" shows bright. How may that be accounted for?

A. It can be accounted for by buffing.

Q. 25. Is there any indication of when this buffing was done?

A. The metal of the spider has not rusted, which, therefore, would indicate that the buffing was done fairly recently.

Q. 26. I show you "Defendant's Exhibit 56", which was the sample welded by Mr. McBerty on the welding device at the Ford plant when we witnessed the operation of that device. Do you observe anything peculiar about the spot welds in this exhibit; and, if so, what?

A. Many of the spot welds in this exhibit indicate that the welding electrodes were not perpendicularly placed to the general plane surface of each blade. This recalls to my mind the actual operation of the McBerty machine at the Ford plant, where I noted that the electrodes in some cases could not be placed perpendicularly to the surface owing to the small gap of the McBerty machine. I remember remarking about this at the time.

Q. 27. What is the effect of the electrodes when operated in positions oblique to the work?

A. This is shown very nicely by the blade with the two file marks scratched on the edge. The tip of the tool has a tendency to run obliquely into the metal. The tip of the tool is indicated by the rust marks in the centre of the heated places, and it will be observed that these rust marks are to one side instead of being exactly centrally located. There is also a tendency to throw a slight raise to one side of the heated spot.

Q. 28. Please compare the spot welds of "Defendant's Exhibit No. 56" in the respects you have just mentioned with the welds in McBerty's affidavit Exhibits O and P, and in "Defendant's Exhibit M".

A. In Exhibit O attached to McBerty's affidavit the welds indicate that the welding electrodes were perpendicularly arranged to

the surface. This is also the case in "Defendant's Exhibit M", and also the case in Exhibit O attached to McBerty's affidavit, and again the case in Exhibit P attached to McBerty's affidavit.

Q. 29. What would this difference in the arrangement of the electrodes with relation to the work indicate?

A. It would indicate that the sections of spider were cut apart from the main spider before welding to the individual blades.

Q. 20. In view of the condition of the exhibits, namely, Exhibits O and P attached to McBerty's affidavit and "Defendant's Exhibit M", were these different samples cut from a spider after the blades had been welded to it?

A. No; this would have been impossible, for two reasons; one is that the welding tools were perpendicularly placed to the surface when the blade was welded, and this would have been impossible in McBerty's machine owing to the limited gap. Then, too, the cut sections of the spiders show blue marks produced by the welding heat. These blue marks could not have occurred had the spider been welded intact and then cut.

#### Cross Examination.

By Mr. PATTISON.

×-Q. 31. Referring to "Defendant's Exhibit M", the blue mark on the spider caused by the welding heat does not extend inward beyond the inner hole of that arm, and I am unable to find any blue mark on the cut part of this spider. Where do you find it?

A. I fail to find it. If you understood that my remarks referred to the bluing on this sample, you are incorrect, because I have never seen any blue marks on this sample. I may have put them together collectively and analyzed the thing, but it was wrong.

×-Q. 32. Who put the file marks on the blade in "Plaintiff's Exhibit 56"?

A. I think I was present when these file marks were put in it and I think it was at the Ford plant. My recollection is rather hazy about this, but I believe Mr. McBerty is the one who did it so that this particular fan could be identified.

×-Q. 33. Do you know who broke apart the weld in the Lipps Exhibit H attached to his affidavit, on one edge of that exhibit as now appears?

A. No, I do not.

X-Q. 34. The sectional spider part of Exhibit O attached to McBerty's affidavit appears to me to be blued all over its surface. Do you agree with me?

A. Yes.

X-Q. 35. The blade part of this same exhibit appears to be blue all over its surface. Do you agree with me on this?

A. Well, I understood you to say blade before when you meant spider.

X-Q. 36. I meant spider.

A. I agree about the blade.

X-Q. 37. What makes you think that "Defendant's Exhibit M" has been nickel-plated?

A. The general character of the surface; also the fact that it has a bright, metallic surface placed on top of a copper surface. It is the usual practice in nickel-plating to first copper-plate and then nickel-plate. The nickel adheres much better to an article if it has first been copper-plated before nickeling. Another reason for supposing this to be nickeled is that under a glass the cut edge of this blade shows signs of rust, whereas the plane surface of the blade seems to be free from rust.

X-Q. 38. Did you say that the blade in the Exhibit O attached to the McBerty affidavit had been blued by the heat from the welding of the spider to it?

A. No, the bluing has not been caused by the welding of the spider to it. This bluing is a regular commercial process on top of copper to give a peculiar oxidized effect. That is the blade we are talking about. The bluing in the arm is a heating effect, whereas the bluing in the blade is a chemical effect.

(It is understood that further cross-examination by Mr. Pattison might be made at the office of Messrs. Stevenson, Carpenter, Butzel & Backus.)

Redirect Examination.

By Mr. STACKPOLE.

RDQ. 29. In the Exhibit O attached to McBerty's affidavit and in the "Defendant's Exhibit M", are both the blade and the spider arm punched with two rivet holes?

A. Yes. "Defendant's Exhibit M" has the portion of the spider arm attached to the blade punched with two rivet holes, and the blade attached to this spider arm is punched with two rivet holes. In Exhibit O attached to McBerty's affidavit the portion of spider arm is punched with two rivet holes, and the attached blade is punched with two rivet holes.

RDQ. 40. How about the spider arm forming part of Exhibit P attached to McBerty's affidavit?

A. The spider arm is shorter than the two we have just been talking about, but at the extreme end of this spider arm the location of the hole is indicated, showing that this portion of the spider arm has also been punched for two rivets; that is, two rivet holes have been provided.

Adjourned to the office of Messrs. Stevenson, Carpenter, Butzel & Backus.

Cross Examination.

By Mr. PATTISON.

RX-Q. 41. Have you testified in this cause heretofore in respect to the disclosure of the Ferranti provisional and complete specifications?

A. I understand by "this cause" you mean *Thomson v. Ford* case, and I answer no.

RX-Q. 42. Have you testified in regard to this same subject-matter in any other controversy?

A. Yes.

RX-Q. 43. What was the controversy?

A. I believe it was in an interference case in the Patent Office between Ferranti and Harmatta.

RX-Q. 44. Is your present deposition any different from what you stated in the interference?

A. I have very little recollection of my deposition at the present time. I have every reason to suppose the substance of my remarks is identical.

Signature of witness and certificates waved by consent of counsel.  
Adjournment until 1.45 P. M.

*Deposition of Frank C. Wagner.*

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Please state your name, residence and occupation.

A. Frank C. Wagner; age, fifty-five years; residence, Terre Haute, Indiana; occupation, professor of mechanical and electrical engineering at Rose Polytechnic Institute.

Q. 2. What are your qualifications which enable you to testify as an expert in this case?

A. I pursued a course in mechanical engineering at the University of Michigan, graduating in 1885. From 1886 to 1889 I was in the employ of the Thomson-Houston Electric Company of Lynn, Mass., engaged in erecting electrical machinery. From 1890 to 1896, I was assistant professor of mechanical engineering at the University of Michigan. From 1896 to the present time, I have taught at the Rose Polytechnic Institute, where for a number of years I have held the position of professor of mechanical and electrical engineering. During all the time that I have been teaching I have also done work as a consulting engineer in both mechanical and electrical engineering lines, and have also testified as an expert in numerous suits involving interpretation of patents. A considerable number of these patent cases have involved the art of heating in boiler furnaces and metallurgical furnaces. I am a member of the American Society of Mechanical Engineers; an associate member of the American Institute of Electrical Engineers; a fellow of the American Association for the Advancement of Science; a member and trustee of the Indiana Engineering Society.

Q. 3. Have you read and do you understand the various patents that have been referred to by Messrs. Gravell and Dyer in this case, and have you read the depositions of Messrs. Gravell, Dyer and Thomson?

A. I have read the prior patents referred to in the question and believe that I understand them. I have also read the depositions of Mr. Gravell, Mr. Dyer and Professor Thomson which have been given in this case.

Q. 4. Will you explain the development of the art prior to the application date of Harmatta in suit as set forth in the prior patents

referred to, and compare that art with the subject-matter of the Harmatta patent?

A. The Harmatta patent in suit relates to the art of electric welding. This art originated with Professor Elihu Thomson in 1886. It was my privilege to hear Professor Thomson's first public lecture upon this new art in the fall of 1886 in Boston.

Welding as practiced prior to the introduction of electric welding was the art of joining pieces of metal together by first raising the portions to be welded to a high temperature and then bringing the two pieces into contact and hammering or pressing the hot metal so as to unite the two parts into a single homogeneous piece.

Not all metals are susceptible of welding according to the old art of the blacksmith. Iron and steel were the only metals commonly welded prior to the introduction of electric welding. It is a characteristic of iron that as it approaches the melting point it becomes soft and somewhat plastic, whereas some of the other metals pass so quickly from the solid to the liquid state that they cannot be worked with in a plastic condition.

It is possible to join metals together or to add additional metal by actual fusion. I do not consider this, however, as a true welding operation. I consider that in welding the heating stops short of actual fusion and that the metal is joined by hammering or pressing the pieces together without actually melting the parts so joined.

I make this explanation in view of the fact that a method of joining metals by fusion, the fusion being obtained by electric heating, as in the case of so-called arc welding, has grown up and is in extended use.

Another method of uniting two pieces of the same kind or of different kinds of metal is by the soldering operation. In this, the joining metal is one which melts at a lower temperature than either of the metals to be joined. The proper method of making a good solder joint is to raise the temperature of both of the bodies to be joined up to the melting point of the solder and maintain a uniform heating at such temperature until the solder flows and unites with the two pieces to be joined. I refer to the soldering operation because several of the patents in this prior art relate to soldering.

In the art of welding iron and steel as practiced prior to the introduction of electric welding, the metal was heated from an external

source, that is, external to the iron or steel pieces that were to be welded. This was commonly done in a blacksmith's forge, or in heating furnaces, using coal, gas or oil for fuel. Owing to the fact that the heat was developed outside of the metal and was transferred to the metal by conduction and radiation from outside sources, the outer surface or skin of the metal would ordinarily be the hottest portion.

In the art of electric welding introduced by Professor Thomson and described in patents No. 347,140 and 347,141, an entirely different method of heating the metal was used. It has been known for a great many years that when an electrical current is passed through a metallic body, heat is developed because of a resistance to the flow of the current. Professor Thomson made use of this property and by passing enormous currents through the metal succeeded in raising the metal to a temperature high enough to permit a welding. By this method the heat is developed within the body of the metal and does not need to be transmitted to the metal from some external source.

The Thomson method of electric welding was particularly adapted to producing what is commonly known as a butt weld. Two pieces of an iron bar may be joined together, and were commonly so joined by blacksmiths, either by placing the heated ends in contact and driving the bars together, or by lapping the end of one bar a certain distance over the end of the other bar after these parts had been raised to a welding temperature and hammering the two pieces together by transverse blows. The former method was called butt welding and the latter method was called lap welding.

To make a butt weld by the Thomson electric welding process, as for instance with two round bars which were to be welded end to end, two heavy clamping heads were provided which were electrically insulated from one another and which could be moved to and from each other. The bars to be welded were firmly clamped in the two heads respectively, with the ends to be welded facing each other. The clamps were respectively connected to the terminals of some source of electrical current, either a generator of large current capacity and low voltage, or an alternating current transformer built to furnish heavy current at low voltage. With the source of current connected to the clamping heads and the rods out

of contact, no current will flow, because the clamps are electrically insulated from each other. If the rods are now caused to approach each other, the moment the ends make contact an electrical current will flow and heat will be generated in consequence. The greatest amount of heat will be generated where the electrical resistance is greatest, which will be at the point of contact between the two rods. Hence, the ends of the rods will be heated most rapidly. Owing to the fact that the electrical resistance of metals increases greatly as the temperature rises, the ends of the rods, having started to heat before the other portion of the rods, will continue to heat more rapidly, with the result that the ends of the rods facing each other will be raised to a welding temperature before the metal at a distance from the ends has become hot enough to lose its strength and rigidity. Consequently, when the clamping heads are moved toward each other and a certain definite pressure is maintained tending to force them together, the ends of the rods will be forced together as soon as a welding temperature is reached, the metal back from the ends being sufficiently rigid to exert a pressure comparable to the force due to the impact of the blacksmith's hammer.

It appears then that the Thomson electric welding process was a true welding operation in which both heat and pressure were utilized to effect the joining. Professor Thomson says in his specifications, page 1, lines 30 to 33: "Briefly, the new art, which I term 'electric welding', consists in bringing together with a certain pressure the ends of the wires, bars, etc., to be jointed."

With this general introduction, I will now consider the patents of the prior art in chronological order with a view of tracing the actual historical development.

Patent to Benardos and Olszewski, No. 363,320, dated May 17, 1887, describes the process of arc welding. At the date of this patent, 1887, electric arc lights were very extensively used, and it was well known that if two conductors of electricity connected to an electric circuit were touched together so as to establish a flow of current, and then separated a slight amount, the current would continue to flow from one conductor to the other, being carried by a vapor stream of particles passing between the conductors. It was well known that the temperature of the electric arc was very high. Benardos utilizes the electric arc as a source of heat for fusing



metal locally. The Benardos process was distinguished from the Thomson process in a number of ways.

First, the heat is developed exteriorly to the piece worked upon and not within the substance of the piece itself. So far as the method of supplying heat is concerned, arc welding, so called, is practically the same as acetylene welding.

Second, in the Benardos process the union takes place by fusion, and not by simultaneous application of heat and pressure, as in the Thomson electric welding.

Third, the mechanical manipulation is entirely different. In Benardos the electrodes are first brought together and then separated. In Thomson the electrodes are continuously pressed together.

I consider that the so-called arc welding, as illustrated by the Benardos and Olszewski patents, and the Thomson process of electric welding are two different branches of the art of electrical heating for welding purposes. Each has had its own line of development, and each is in extended use at the present time. The Har-matta patent in suit belongs in the line of development from the Thomson method of electric welding, and I consider that patents relating to so-called arc welding belong to an entirely different branch of the electrical heating art.

Thomson patent No. 396,015, dated January 8, 1889, is for a method of electric riveting. This patent belongs in the line of development from the original Thomson patent in that the heating is done within the body of the metal which is being worked upon. In this patent the object aimed at is to heat the rivet sufficiently to permit the ends being upset and formed into heads. The heat is generated by passing an electrical current longitudinally through the rivet. After the proper temperature has been reached, the same heads which served to convey the current to and from the rivet are used to form the rivet heads by being forced together with a sufficiently great pressure. In the specification the inventor states that sometimes the body of the rivet is welded to the plates so that for a certain distance both plates and the body of the rivet become a continuous piece of metal. This result is incidental, and arises from the fact that since the heating of the rivet takes place throughout the entire body of the rivet, and the ends of the rivet lose heat

by radiation and conduction to the electrodes, while the body of the rivet is surrounded by the plates and the heat can escape only by conducting into them, the body of the rivet reaches a welding temperature by the time the heads are hot enough to be swaged over.

The action just described is assisted by the clamps shown in Figure 10 of the patent when these clamps are not insulated electrically from the plates. In this case a certain amount of current will flow through the plate from one clamp to the other, and by generating heat will diminish the flow of heat by conduction from the body of the rivet to the plates. I do not find in this patent any intimation that welding takes place in any other way than by the heat conducted from the body of the rivet to the adjacent portions of the plates.

The Coffin patent, No. 437,571, shows a method of electrical welding in which the heat is developed partly by poorly conducting electrodes, partly by heat generated in the material to be welded. Instead of passing the current from one bar to the other across the joint which is to be butt welded, Coffin provides an electrode of carbon movable vertically and a similar block of carbon not connected to the source of electrical current. The ends of the pieces to be welded are placed between these carbon blocks and one or both of the pieces so connected electrically that the current flows through one carbon block into and through either one or both of the pieces worked upon. Heat is developed at the points of contact between the rod and the carbon and in the carbon itself and transferred by conduction and radiation, which includes the lower carbon block through which electricity does not flow, until the ends of the rods are raised to sufficient temperature to permit of welding. Then the rods are forced together by suitable mechanism to make a butt weld. The principal source of heating in the Coffin method seems to be in the carbon blocks and not heat generated in the body of the metal being welded. In Figure 4, for instance, the electrical current does not pass at all through one of the rods. If a considerable portion of the heat developed were due to the electrical resistance of the rod itself, then the right-hand rod in this figure, which is traversed by the electric current, would reach a welding temperature long before the left-hand rod which is not traversed by

the electric current. Coffin's invention appears to be an attempt to secure a true welding operation by electrical heating and simultaneous pressure, the heat being generated not in the body of the metals being welded, but exteriorly by electrical means.

A year earlier than the Coffin patent is the German patent to Benardos, No. 50,909, dated May 8, 1889, and published February 19, 1890. This patent is for a device quite similar to the Coffin device, and makes use of a heating element consisting of a poor conductor of electricity just as in Coffin. The inventor distinctly says that his process is clearly distinguished from the prior Benardos process which uses the electric arc, and also from the electric welding process of Elihu Thomson. This process as well as the Coffin process might be termed the resistor method of heating. The heat is developed in a poorly conducting body exteriorly to the piece being worked upon and transferred by conduction and radiation to the work. Benardos shows, in Figures 1, 2, 3 and 6, what is practically an electrical soldering iron and is so described. In Figures 4 and 5 he shows a device for butt welding rods in which the resistors practically constitute an electrical furnace and in which the arrangement is very similar to that of Coffin.

The next patent in order is Thomson's patent No. 444,928, January 20, 1891. This patent is for a method of lap welding, and is along the line of development from the original Thomson patent. As illustrated in Figure 1 of this patent, when it is desired to join two sheets of metal the edges are lapped a certain amount and the lapped portions passed between a pair of rolls, the individual rolls of which are electrically insulated from each other and connected to the terminals of a source of electrical current. One of these rolls can be moved toward the other and a pressure exerted between the two.

With the plates overlapping each other, placed between the rolls, and the current flowing from one roller to the other across the contact surface of the overlapping plates, heat is developed, and as the plates are passed through the rolls the combination of pressure and heating welds together the overlapping portions. The amount of heat developed is determined by the amount of overlapping, and the entire opposed surfaces are welded together.

Both lap welding and butt welding were common practices in the

blacksmith art. Just as in the original Thomson patent, Professor Thomson accomplished butt welding by developing heat in the metals to be welded and at their points of contact, so in this latter patent he accomplished lap welding in a similar manner. In both cases the heat was developed in the work itself and not exteriorly.

Blanchard patent No. 466,266, dated December 29, 1891, is for an electric heating tool to be used for heating rivets. In this device the electrical current is passed through the rivet transversely, raising it to the required temperature. So far as the heating concerned, the rivet is heated by the electrical current within itself in a manner similar to that in the Thomson riveting patent. No welding is involved.

Thomson patent No. 496,019, dated April 25, 1893, is for a soldering device. In this patent Professor Thomson departs from the idea of his original patent, which was to develop the heat required in the metal that was being worked, or at the point of junction between pieces to be joined. He purposely introduces electric resistance exteriorly to the pieces worked upon. This gives a method of heating well adapted to the soldering operation, in that it causes the plates which are to be united by the solder to be at least as hot as the melting point of the solder itself, which is a necessary condition for good soldering. In this respect soldering differs from welding. In welding it is desirable that the points of contact where the weld takes place should be hotter than adjacent portions of the pieces being joined.

Professor Thomson says, on page 1, lines 44 to 56:—

"My invention comprises further an improvement in electric soldering, consisting essentially in establishing an electric resistance to the passage of the current from the clamp or pressure block bearing on the joint to the metal or the work to be joined. This may be done either by modifying the surface of the pressure block itself, or by modifying the surface on which it bears, or both, or by the interposition of a thin septum, layer, or zone or resisting material or material modified in condition or form so as to oppose a resistance to the passage of an electric current."

British patent to Parkinson and Gatwood, No. 14,536, accepted July 27, 1895, shows a device for filling in the corners between spokes and rim of a wheel with molten metal and welding it

adjacent parts. The device is quite complicated and consists essentially in providing a mold in sections to be brought together by an hydraulic plunger, and in passing heavy electrical currents through the metal to be heated, so as to bring the metal to a welding heat, and then by the action of the plungers compress the metal into the corners between the spokes and the rim. The operation is described as glutting. This patent is along the line of development started by Professor Thomson, in which the heating is developed by the electrical resistance of the metal being worked upon.

Patent to Lemp No. 531,197, dated December 18, 1894, is for a method of locally annealing steel plates. This patent also is along the line of Professor Thomson's original idea of developing heat by the electrical resistance of the metal being worked upon. It is not, however, a welding operation, the purpose being simply to heat a hardened steel plate locally so as to anneal only a limited portion, leaving the remaining portion hardened. The temperature required for annealing is much lower than the welding temperature.

In one form of the device the two electrodes leading the current to and from the steel plate are placed a short distance apart, and both in contact with the same surface of the plate. The electrical current passing from one electrode to the other through the metal of the plate heats the plate locally. If it is desired to anneal the plate through its entire thickness, as when, for example, it is required to drill a hole through the plate, then the electrodes are placed on opposite sides of the plate, so that the current flows through the plate from one side to the other.

Adjourned to 9 o'clock, July 15, 1919.

DETROIT, MICH., July 15, 1919.

Met pursuant to adjournment. Counsel present as before.

Answer to Q. 4 continued:

Lemp patent No. 553,923, dated February 4, 1896, is for an improvement on the Thomson roller welding patent No. 444,928, and aims to correct deficiencies in properly heating the metal in the prior Thomson device. The invention of Lemp related to providing additional heating means. Where a long strip or seam was to be welded, Lemp provides for sending electrical current through the metal plate longitudinally of the strip or seam, in addition to the transverse currents which were used in the earlier Thomson

process. The general position of this Lemp patent in the art is the same as that of the Thomson roller welding patent. It makes use of the principles of the original Thomson fundamental patent on electric welding, in that the heat is developed within the material worked upon.

Robinson's patent No. 574,942, dated January 12, 1897, is for a rail joint said by the inventor to be adapted to the electric welding process. The general idea of the Robinson invention is to provide projections on girder plates and fish plates and to weld these projections to the rail, those upon the girder plate to the bottom of the rail, and those upon the fish plate to the web of the rail. He does not describe any apparatus for accomplishing these welding operations. He apparently considers the operation to be a simple case of butt welding of the projections provided to the rail, and that the apparatus to be employed would be such as is commonly used for butt welding.

Patent to Kleinschmidt No. 616,436, dated December 20, 1898, is for a device for welding splice bars to rails to make a continuous railway track. Two splice bars are used, placed on opposite sides of the web of the rail, each splice bar having three projecting bosses; the splice bars are placed with the bosses in contact with web of the rail, and the bosses on one splice bar directly opposite to those on the other. Electrical current is furnished by a powerful transformer and passed through from one splice bar to the other. As electrical contact is made only through the bosses, the bosses and adjacent portions of the rail web are heated to a welding temperature, and then the splice bars are forced together with a great pressure and the weld completed.

The Kleinschmidt invention is along the general line of the fundamental Thomson electric welding process in that the heat is generated in the metal being worked upon and at the points of contact where welding is to take place. It is substantially a case of butt welding and differs from the original Thomson patent chiefly in the fact that three butt welds are made simultaneously, instead of a single butt weld as in the original Thomson patent.

Patent to Burton No. 647,694, dated April 17, 1900, is for a method of heating metals electrically in a convenient position to be quickly transferred to the blacksmith's anvil. Burton provides for

attaching one terminal of his electrical circuit to a copper block fastened to, but insulated from, the anvil. He then provides for the other terminal of an electrical circuit a number of differently shaped electrodes fastened to spokes of a wheel mounted on a swinging arm. In this manner he connects the particular form of electrode adapted to the work being done. He lays the metal to be heated upon the stationary electrode and then brings the movable electrode to a position upon the top of the work, and turning on the current heats the work at the desired place by the passage of electrical current through it. When the metal has reached the proper temperature the current is shut off, the piece removed to the anvil for welding or forging as may be required.

The Burton device is essentially a heating device or electric forge. It makes use of the principles of generating heat within the material to be worked upon by means of electrical current; and in this sense it belongs in the line of development from the original Thomson patent welding.

Perry patent No. 670,808, dated March 26, 1901, is for a method of welding wires or rods crossing each other at an angle. The wires contact with each other over a very small area, theoretically not much more than a point at the start. Electrodes are provided, one in contact with either wire, and an electrical current passed from one to the other. This patent also is in the line of development of the original Thomson electric welding patent. The heat is generated at the point of contact where the weld is to take place and within the parts to be welded. The particular problem solved by Perry was to effect a weld under these conditions without burning off the wires or injuring them, and his device is apparently well adapted for this purpose. It illustrates the fact that the fundamental Thomson electric welding patent did not cover the field in such a way as to shut out future inventions in the application of the broad principles of electric resistance welding to special problems. Thomson's original patent did not show how such work as is done by the Perry device could be successfully and commercially accomplished.

British patent to deFerranti No. 11,921, accepted August 25, 1904, relates to the electric welding of turbine blades to the disk upon which they are mounted. The blade of a steam turbine is of



relatively small dimensions compared to the disk to which it is attached. When it is attempted to weld the blade to the disk without special preparations, the disk conveys the heat away from the joint more rapidly than does the metal of the turbine blade, so that the turbine blade is raised to a welding temperature before the adjacent portion of the disk. This difficulty will be experienced in the practical carrying out of the welding of the Robinson rail joint, and it is doubtful whether for this reason the Robinson rail joint patent has any practical commercial value.

To overcome this difficulty, deFerranti reduces the sectional area of the metal through which the current flows in the portion of the disk contacting with the turbine blade so as to make it substantially equal to the sectional area through which the current flows in the blade itself. He does this by cutting grooves in several different manners on the external surface of the turbine disk. He thus leaves a certain number of projections upon the surface of the disk opposite each turbine blade, sufficient, as he says, to provide mechanical strength when welded to the blade. The deFerranti invention then is substantially a method of butt welding a number of projecting parts simultaneously to another piece. It is another instance of development along the line of the fundamental Thomson electric welding patent and shows the field open for invention in the application of electric welding to particular problems.

We come now to a consideration of the Harmatta patent in suit, No. 1,046,066, dated December 3, 1912. Harmatta undertakes to solve a problem different from those dealt with by prior inventors, but falling also under the general line of development from the original Thomson electric welding patent. In most of the prior patents which I have considered, inventors were trying to accomplish by electric welding something which had previously been done by a blacksmith using ordinary heating methods. The original Thomson patent proposed to make butt welds of rods and bars, a thing which a blacksmith commonly did. The Thomson roller welding patent also attempted to do by electrical methods what was formerly done in metal working, namely, to make lap weld seams. Kleinschmidt performed a butt welding operation which might have been done in a well equipped forge shop, but which was novel



because of necessity the work was required to be done away from a forge shop and required portable apparatus.

Harmatta, however, attacks a problem which had never been solved by blacksmithing methods. His problem was to fasten together by electric welding flat sheets of metal placed one on top of the other. In the sheet metal art, this had been done previously by the use of rivets. Harmatta replaced rivets by electrically welding the plates at the spots where riveting would ordinarily be used. The method employed by Harmatta was to place electrodes opposite each other with the plates to be joined lying between the electrodes; one of the electrodes was stationary, the other electrode could be moved toward the stationary electrode and forced toward it with considerable pressure. A suitable electric current was passed through from one electrode to the other and a pressure exerted upon the movable electrode. It was found that the current thus passed through the two plates pressed together would raise the metal to a welding temperature and the pressure would produce a weld.

In the development of the art of electric welding prior to Harmatta the area of the surfaces in contact between the two pieces to be welded was always limited in extent. In the original Thomson patent the area of the ends of the rods being joined was the contact surface, and determined largely the amount of heat developed. In the Thomson and Lemp roller patents the amount of overlap of the plates restricted the area of contact surface. In the Robinson, Kleinschmidt and deFerranti patents the size of the projections determined the contact surface, and in all these cases the completed weld was of substantially the same area as the contacting surface.

There was, therefore, nothing in the prior art to show Harmatta that when two sheets were placed one upon the other, contacting over a large area, these sheets could be welded together in an isolated spot. I do not believe that anyone skilled in the art at the time of Harmatta's invention could have stated with any degree of assurance in advance of actual trial that Harmatta's device would produce a real serviceable weld.

It is true that Lemp has shown in his annealing patent, No. 531,197, that by placing electrodes on opposite sides of a piece of armor plate a sufficient temperature could be reached in the line

between the two electrodes to anneal the plate locally. In this case the path of the electrical current was entirely through a homogeneous piece of metal. The shortest path for the current was, of course, directly from one electrode to the other, but since the entire plate was a conductor of electricity, more or less of the current would spread out and flow through other paths. The action is also complicated by the fact that as the metal in the direct path is heated and rises in temperature its resistance increases, which would tend to divert a greater proportion of the current through surrounding portions of the plate.

At the same time, since the iron or steel is a fairly good conductor for heat, the heat generated would flow away toward cooler parts of the plate. Evidently in the case of the Lemp annealing operation the actions taking place are quite complex, and I doubt very much whether Mr. Lemp himself, skilled inventor though he was, felt any great degree of certainty that the operation would be successful in advance of actual trial.

In the Harmatta process of spot welding the reactions are much more complex than in the Lemp annealing operation. The current instead of passing from one electrode to the other through a homogeneous plate passes first into one plate, then across a contact area into another plate and then out at the second electrode. There are thus two plates through which the current is at liberty to spread, and a contact resistance between the plates. The temperature to which the metal must be raised is a welding temperature instead of merely an annealing temperature. For a proper welding operation the temperature of the metal at the weld should be higher than in the metal adjacent thereto so that the relatively cooler metal may exert sufficient pressure to force the welded parts together. Thus, in the Harmatta operation the contacting surface between the two plates directly in line between the electrodes should be the hottest portion of the metal, and the metal adjacent to the electrodes should be somewhat cooler in order to transmit the pressure from the electrodes to the metal at the points welded. If, for instance, the metal adjacent to the electrodes were hotter and softer than the metal where the plates make contact, it might easily be that, instead of making a weld, the electrodes would punch a hole in the plates.

For the reasons given above, it is my opinion that the flow of

electricity and of heat in the practice of the Harmatta process of spot welding is so complex that the teachings of the prior art would not suggest the Harmatta invention, and that with the knowledge and skill available at the date of the Harmatta invention it would not be possible to state whether or not the Harmatta process would be successful in producing commercially valuable welds. As a matter of fact, the Harmatta process of spot welding has proven of immense commercial value, and the fact that the operation seems so simple after it has once been accomplished should add to rather than detract from the merit of the invention. It is the more remarkable in that the fundamental Thomson electric welding patent antedates the Harmatta invention by some seventeen years; and that, while the art was developed in a number of other directions, the development of spot welding waited so long. The reason for this seems to me to be that in the other lines of development of electric welding the attempt was made to accomplish by electric welding what had previously been done by other metallurgical or blacksmithing operations. Harmatta struck out in a new field and accomplished something which had never before been accomplished by any method, namely, the welding together at isolated spots, and without previous preparation, parallel, superimposed metal sheets.

One P. M., pursuant to adjournment, at the office of the clerk of the United States Court.

By Mr. STACKPOLE.

Q. 5. Please look at "Defendant's Exhibit No. 2", the 1901 catalogue of the Warren Electric & Specialty Company, and state what rivet heads you find shown in the pictures of the different desk fans illustrated in the catalogue.

A. In fan marked "A-1" rivet heads are shown on the front sides of all of the fan blades.

Q. 6. And in what relation?

A. Spaced at the corners of a triangle approximately. In A-2 rivets are shown on the front faces of all of the blades, three rivets to a blade, spaced in triangular relation. Fan A-3 rivets are shown on the faces of all of the blades, three to a blade, triangularly placed. Figure A-4 rivets are shown on the faces of the blades, three rivets triangularly spaced. On the upwardly extending blade a rivet head

appears also on the back side. Figure A-5 the rivets are very indistinctly shown; appear to be two rivets to a blade. Figure A-6 the rivets are shown on the front sides of the two blades at the right, two rivets to a blade. On the other fan blades rivets appear to be obscured by the fan guard, a portion of one rivet showing on the left-hand lower blade. Fan E-1, two rivets are shown on the blade extending to the right; one rivet appears on the blade extending downward toward the centre; the other rivets do not appear,—that is, rivets on the other blades do not show. In E-2 there are three rivets to a blade in triangular relation. These show on the blade extending upward and the one extending to the left, but do not show on the blades extending to the right—yes, one shows on the blade extending to the right, but they do not show on the blade extending toward the bottom. Fan E-3 I can distinguish one rivet on the fan blade extending upward. On the other fan blade I cannot find any rivets showing. Fan E-4, two rivets show on the fan blade extending to the left, two on the fan blade extending upward, two on the fan blade extending to the right, and two on the fan blade extending downward, one of these showing on the back side of the blade. Fan G-1, the rivets are three to a blade, arranged triangularly; two of these rivets show on the blade extending to the left, and none on the blade extending upward, two very faintly on the blade extending to the right, and one faintly on the blade extending downwardly. On G-2 fan rivet heads do not show on the faces of the fan blades, but one rivet head shows on the back side of the spider arm of the blade extending downward.

Q. 7. Do you find any fan blades described in this catalogue which are made of steel and which are copper-plated or nickel-plated?

A. I do not. The fan blades of all of the types of fans illustrated, except type G, are stated to be finished in polished brass, and other finishes if specified. In the general description of these fans the statement is made that the blades are of best quality of heavy spring brass. In the G-1 and G-2 type fans the statement is that the finish throughout is plain black enamel. No statement is made that different finishes will be furnished with this type fan.

Mr. PATTISON. The foregoing question and answer are objected

to as being secondary evidence, the catalogue itself being the best evidence of what it describes or shows.

Q. 8. Please examine the Exhibit H attached to Lipps' affidavit, "Plaintiff's Exhibit No. 30", and state whether this exhibit is spot welded.

A. I should say not. There appear to be four places where current has been passed through, and at one of these places, which from the appearance of the surface was as highly heated as any of them, the plates have parted at the point where the current passed through. There was no weld at this place. By looking through the place at the other edge, which has not fully parted, it is apparent that there is no weld at this point either, as light can be seen through between the plates at the place where the weld should have been. The other two spots do not have the appearance of having been heated to a sufficient temperature to produce a weld. It is a characteristic of a real spot weld that when pulled apart it will tear out some of the metal from one or the other of the plates. I should not consider the welding as shown by this Lipps Exhibit H as of any commercial value whatever.

Q. 9. Look at the Exhibit O attached to McBerty's affidavit, "Plaintiff's Exhibit No. 28". Of what material and finish is the blade of this exhibit?

A. The blade is of iron or steel which has been copper-plated and afterwards blued.

Q. 10. How is that bluing done?

A. The bluing would be done by using some chemical solution to produce an oxide of copper. Various colors can be produced by different chemical solutions.

Q. 11. On this same Exhibit P please examine the cut portion of the spider arm, and state if that shows signs of oxidization.

A. It shows a blue oxide of iron which is produced when iron oxidizes at a relatively high temperature.

Q. 12. What would that indicate with reference to the time when the arm was cut in relation to the time when the welding was done?

A. It would indicate that the iron had been heated up to a temperature sufficient to give blue iron oxide after the piece was cut.

Q. 13. Please examine the Exhibit P attached to McBerty's affidavit as to the same questions, and state the result.

A. Exhibit P attached to the McBerty affidavit also shows a blue oxide of iron at the cut portion of the spider, which would indicate that this part had been heated to a sufficiently high temperature to produce blue oxide after cutting.

Q. 14. Referring again to Exhibit O attached to McBerty's affidavit, do you find any indication that the blade had been riveted?

A. Yes; there is an annular mark about the hole in the surface of the blade, such as would be made by the rivet head being forced down into contact. This shows upon both of the rivet holes.

Q. 15. How about the spider arm in this respect?

A. The spider arm shows similar marks, but not quite so plainly.

Q. 16. Look at "Defendant's Exhibit M", and state the character of the blade and whether it has been finished; and, if so, in what way?

A. The blade of "Defendant's Exhibit M" appears to be of iron or steel, copper-plated and then nickered.

Q. 17. Do you find any indication on this blade of its having been riveted?

A. Yes; there are annular marks about the holes such as would be made by rivet heads.

Q. 18. Did you have this exhibit in your hands during the trial of the case before Judge Killets recently?

A. I did.

Q. 19. Did you scratch it in any way?

A. I did not.

#### Cross Examination.

By Mr. PATTISON.

X-Q. 20. While defendant did not present the exhibits attached to the affidavits of Lipps and McBerty and is not responsible for them, I will ask you a few questions about them. You have stated as to Exhibit H connected to Lipps' affidavit that it is not spot welded. How are the two plates there attached?

A. I should say that they were probably stuck together by iron oxide.

X-Q. 21. Caused by what?

A. Caused by heat at the time the attempt was made to do the spot welding.

×-Q. 22. What caused the heat?

A. Apparently an electrical current passed through the plates.

×-Q. 23. By the use of electrodes on opposite sides?

A. Apparently so.

×-Q. 24. With the apparatus disclosed in the Harmatta patent in suit, the character of the weld depends upon the judgment of the operator, doesn't it?

A. The character of the weld would depend upon the adjustment of current relative to the size of the weld; also upon the skill of the operator.

×-Q. 25. And with that apparatus a current could be passed through the two lapped plates a sufficiently short length of time to make the same kind of an effect as in this Exhibit H attached to Lipps' affidavit, couldn't it?

A. That is true; if the current were not properly adjusted or the operator not skilled, the plates might be stuck together as shown in the exhibit referred to.

×-Q. 26. Referring to the Exhibit O attached to McBerty's affidavit, how can you tell that the fragment of spider was not blued in the same way the blade was blued?

A. If that were true, then the bluing must have been done after the spider was cut apart. It is rather difficult to tell definitely which was the actual cause of the bluing, but if the spider arm had been cut off and neither heated nor processed, the color of the cut would not be that shown.

×-Q. 27. Then, from your conclusion I gather, after several minutes' close scrutiny of the exhibit through a magnifying glass, that it is possible that the spider and blade were blued in the same way?

A. Yes, if the bluing were done after the spider were cut off.

Adjournment to the office of Stevenson, Carpenter, Butzel & Backus.

Pursuant to adjournment to the office of Stevenson, Carpenter, Butzel & Backus.

×-Q. 28. Referring to the Harmatta patent in suit, in your opinion, what is the maximum limit of the cross-examination diameter of electrodes that can be used to practice the Harmatta method and produce the article of the patent?



A. I think the diameter of the electrode used would depend somewhat upon the thickness of the sheets which were being spot welded. I have not had sufficient practical experience with spot welding to be able to state the possible limits.

X-Q. 29. Then you have no opinion on this question?

A. Only to the extent I think the size of electrodes would vary with the thickness of the plates to be welded, and that the relationship would be somewhat like that shown in the Harmatta patent. It would probably vary within certain limits.

X-Q. 30. Do you think electrodes with points of half inch diameter could be used with the proper thickness of plates?

A. I think with plates a couple of inches thick, and with sufficiently heavy current, electrodes half inch in diameter could probably be used. I understand that spot welding has actually been done on plates as much as two inches thick.

X-Q. 31. Is it your understanding of the Harmatta patent that the method can be practiced with electrodes having flat ends?

A. It is my understanding that whatever the shape of the points at the start they very soon become more or less rounded in actual operation.

X-Q. 32. I would understand from this that you can practice the Harmatta method with electrodes having flat ends?

A. I am not sure that I understand the exact intent of the question. Does the question mean that the flat end shall be of the same diameter as the main part of the electrode rod, or that the end may be flat and then the rod tapered above the flat end? My answer would differ according to my understanding.

X-Q. 33. You may consider the question from either of the angles mentioned by you.

A. If the electrode were tapered down toward the point so that the cross-section of metal from the contacting point continuously increased, I do not think it would make any difference whether the actual contact were flat or not. If the electrode were simply a round rod cut off square and flat at the end, I do not think it would be adapted,— certainly not well adapted,— to perform the Harmatta operation.

X-Q. 34. But you could weld lapped plates with a straight electrode having flat ends, couldn't you?



A. I think it could probably be done.

×-Q. 35. What is your understanding of the object of providing the ends of the electrodes in Fig 3 of the Harmatta patent with longitudinally extending recesses in their ends?

A. I understand the object is to reduce the area of contact between the electrode and the plate. I doubt, however, if electrodes of that form could be used very long without becoming convex instead of concave as shown.

×-Q. 36. Take two overlapped plates with the Harmatta weld of, say, two-eighths of an inch in diameter, and drill a hole through the centre of this weld of, say, half the diameter or the weld; is the Harmatta spot weld still present?

A. Something more than half of it would be.

×-Q. 37. Would that part of the spot remaining be the spot weld of the Harmatta patent, in your opinion?

A. I should consider that if the weld were made by the Harmatta process the drilling away of portion of the welded piece would not change that fact.

×-Q. 38. Now, take two overlapped plates with registering openings, say one-eighth of an inch in diameter, and take the same Harmatta apparatus and make the quarter-inch diameter weld with the opening in the centre of it; would you have the Harmatta spot weld?

A. I think so.

×-39. Now, take two lapped plates with one-eighth inch diameter registering openings and fill the opening with metal, and take the same Harmatta apparatus and make a quarter-inch diameter weld with the opening and the filling in the middle of it; would you have as a result a Harmatta spot weld?

A. That would depend upon the manner in which the hole was filled with metal, and whether in producing the weld the Harmatta operation actually occurred.

×-Q. 40. Take the illustration of the preceding question, and fill the opening with metal, the ends of which were level with the outer faces of the sheets; would the result be a Harmatta spot weld?

A. It might be.

×-Q. 41. Take the example recited in the second above ques-

tion, and put in the hole a piece of wire of the length equal to be not exceeding the combined thicknesses of the two plates, and with the Harmatta apparatus make a quarter of an inch weld with this wire and opening; in the middle of it would the result be a Harmatta spot weld?

Mr. STACKPOLE. These questions are objected to as relating to hypothetical and imaginary structures of which no concrete example is given, and which are not represented by the prior art, and hence the questions are objected to as outside the scope of direct examination.

A. I think the resulting weld might be called a Harmatta weld.

×-Q. 42. Take this same example, and let the wire extend on thirty-second of an inch beyond the outer surfaces of the two plates, and with the Harmatta apparatus make a quarter-inch weld with the wire in the centre of it; would the result be a Harmatta spot weld?

A. If the wire completely filled the hole so that the electrodes contacted only with the ends of the wire and not with the plates, then I would not consider the weld would be a Harmatta weld. In that case, the heat would be generated in the wire.

×-Q. 43. Now, take the example of the preceding question and make your weld with the form of electrodes shown in Fig. 3 of the Harmatta patent so that the projecting ends of the wire extend into the recesses of the electrodes, and the electrodes engaged the plates; would the result be a Harmatta spot weld?

A. If the electrodes engaged the plates in such a way that the current flows through the plates and the contacting portion between from one electrode to the other, to that extent I should say that the weld was a Harmatta weld.

×-Q. 44. Referring now to Benardos' patent 363,320, on page 2 thereof, line 27, I find: "In this figure, the apparatus is shown in operation uniting the two plates by a process akin to riveting." In Fig. 3 of this patent the electric welds are shown as isolated; are they not?

A. In Fig. 3 the metal plates are shown to be joined at isolated spots by fused plugs of metal. I should hardly call these welds.

×-Q. 45. But your interpretation of Fig. 3 does not appear

correspond with the description of the patent wherein it is stated on page 2, line 29, that:

"By the action of the voltaic arc the metal is gradually melted, the fusion extends through into both plates, the melted portions of which mingled together, so that when the same cool, the two plates, as to said fused portions, are virtually in one homogeneous piece."

I do not find anything about metal plugs, nor any shown in Fig. 3. How about that?

A. The portion quoted in the question is not stated in the specification to apply particularly to Fig. 3, but is a general statement of a working of the apparatus, and whether or not the holes are simply filled with plugs of metal or whether the two plates are fused together, as described in the quotation given in the question, evidently depends upon the length of time during which the voltaic arc is allowed to act. In Fig. 21, for instance, fused metal is allowed to drop upon the plate in order to produce raised letters thereon. I note also that according to this Benardos operation for joining plates in spots, it is necessary to drill holes and otherwise prepare the metal at the places to be joined, as well as to introduce additional metal, and that the whole operation is one of fusion rather than welding; none of which things are required in the Harmatta process.

Deposition closed.

Signature and certificate waived by consent of counsel.

Mr. STACKPOLE. Plaintiff's counsel hereby gives notice that he will proceed to take the deposition of James H. Gravell at the office of Messrs. Fish, Richardson & Neave, 84 State Street, Boston, Mass., on Tuesday, July 22, 1919, at 10 A. M. Counsel for defendant is invited to attend and cross-examine.

BOSTON, MASS., July 22, 1919, 2 P. M., 84 State Street.

Met pursuant to adjournment and agreement of counsel.

Present: J. L. STACKPOLE, Esq., Counsel for Plaintiff;

ALEXANDER S. STEUART, Esq., Counsel for Defendant.

*Fifth Deposition of James H. Gravell.*

Direct Examination.

By Mr. STACKPOLE.

Q. 1. Did you go this morning with Mr. Steuart and myself to the works of the Thomson Spot Welder Company at Lynn, Mass., and there perform certain operations of welding?

A. Yes.

Q. 2. Did you perform any operations then illustrating the welding of turbine blades to specimens which had been cross-cut with grooves in accordance with one of the modifications of the British patent to Ferranti No. 11,921 of 1903?

A. Yes.

Q. 3. Please describe these operations, describing first the parts with which you operated.

A. Small blocks of metal corresponding to sections of the carrying disc were grooved by cutting with a saw. These grooves were cut across obliquely from face to face of the block, and then another series of grooves were cut obliquely so as to cross the first set of grooves. This produced a number of square projections. The saw cuts were approximately one-eighth of an inch deep and between a sixty-fourth and a thirty-second of an inch wide. Steel blades were prepared corresponding to the blades used on a turbine wheel. In performing the experiment the block representing the turbine disc was clamped in one terminal of a butt welding machine, and the blade representing the blade of a steel turbine was clamped to the other terminal of a butt welding machine. The end of the steel blade was allowed to project about three-sixteenths of an inch out from the clamp which held it. The end of the turbine blade was brought into contact with the flat surface of the block which had been grooved as described, and the switch of the welding machine closed to pass current from one electrode to the other through the work. The end of the blade and the ends of the projections in

contact with the blade soon attained a welding temperature, and on the application of pressure the blade was forced into the disc and an electric weld resulted, uniting the blade to the block representing the disc.

Q. 4. How many welds and how many specimens did you make by this method in the presence of myself and Mr. Steuart?

A. Three specimens of deFerranti's cross-groove welding were made. Specimen No. 1 has two blades attached to it; that is, two samples of welding were performed on sample No. 1. On sample No. 2 one blade was welded, on sample No. 3 one blade was welded.

Q. 5. Were the conditions in making sample No. 3 exactly the same as in making the other samples?

A. No; the blade was made a little shorter, so that it projected about one-sixteenth of an inch from the clamps instead of three-sixteenths, which was the amount the blades extended in the other samples.

(Plaintiff's counsel offers in evidence the three samples produced in the operation, and the same are marked "Plaintiff's Exhibit No. 42, Gravell's First Sample of Ferranti Welding", "Plaintiff's Exhibit No. 43, Gravell's Second Sample of Ferranti Welding", and "Plaintiff's Exhibit No. 44, Gravell's Third Sample of Ferranti Welding".)

Q. 6. Referring to these samples of Ferranti welding, please state the quality of the welds.

A. The welds and samples Nos. 1 and 2 seem to be very good welds. In the case of sample No. 3 the weld may be good, but if I was to weld a complete turbine so that I would be sure each weld was good, I would allow the blades to project from the clamps, as was done in samples Nos. 1 and 2.

Q. 7. Do any of these samples of Ferranti welding show welds in either of the pieces surrounded by unwelded areas?

A. Certainly not.

Q. 8. Do you regard these samples as fair examples of what would result from the process described in the deFerranti patent and applied to the modification in which "intersecting sets of grooves inclined to one another may be cut on the edge of the ring" (Ferranti patent, Provisional Specification, page 1, lines 22, 23)?

A. Yes; if I had made these experiments at the time this provisional specification issued, I certainly would have done exactly the same thing.

Q. 9. Did you see and examine the electric welding machine, so-called the McBerty electric welding machine, comprising an electric welding device and a transformer which was exhibited in court and operated by Mr. McBerty at the plant of the Ford Motor Company during the hearing before Judge Killits?

A. Yes.

Q. 10. Have you had made an electric welding machine similar to that McBerty machine?

A. Yes.

Q. 11. Did you make welding tests this morning on such a machine?

A. Yes.

Q. 12. How, if at all, did that welding machine differ from the McBerty welding machine?

A. This machine differs in one respect as far as I can possibly tell, and that is the secondary of the McBerty machine had four turns, whereas the secondary of the machine which I operated today had but a single turn. The clamps, core, primary and length of secondary circuit I believe were exactly the same in the two machines.

Q. 13. How about the taps on the primary of the transformer?

Mr. STEUART. Evidence in regard to the alleged machine objected to as secondary evidence and as immaterial and irrelevant.

A. The taps on the reproduced McBerty machine are the same as on the original so-called McBerty welder exhibited at the Ford plant and in court.

Q. 14. When you operated the machine at the plant of the Thomson Company this morning, what was the voltage of the current through the primary, how many turns were there in the primary through which this current passed and what was the resulting voltage across the terminals of the welding devices?

A. According to the meters which were placed on the machine, the voltage applied to the primary of the welding machine was approximately 250 volts. The open-circuited secondary voltage

according to a low reading voltmeter supplied by the Thomson Company was 1.07 volts. The number of turns in the primary circuit was 222 or 223 and the number of turns in the secondary circuit was one. There were a number of taps on the primary circuit ranging from 500 turns down to the 222 turns. The machine was connected in the strongest position for current in the secondary circuit.

Q. 15. How do you calculate the voltage in the secondary circuit if you are given the voltage in the primary circuit and the number of turns in the primary and secondary respectively.

A. The way the secondary voltage is calculated is to first find the ratio of the number of turns in the primary and secondary circuits. Then knowing this ratio we know that the voltage of the secondary circuit is inversely proportional to the primary circuit. In this case I would first find the number of turns in the primary and then the number of turns in the secondary and divide the number of turns in the secondary into the number of turns in the primary, then the number I obtain by this division I would divide into the voltage of the primary and thereby obtain the voltage of the secondary.

Q. 16. Assuming that the McBerty machine in its present condition with the exception of the number of turns in the secondary is the same as it was in 1901, and assuming that the record in McCurdy's Transformer Book, that there was one turn in the secondary of the transformer, is correct, please state whether or not the machine which you operated upon at the Thomson Company's works this morning is a correct representation of the McBerty machine as equipped with the said transformer having one turn in the secondary.

A. With the exception of having one turn in the secondary, the machine I operated on this morning is identical with the McBerty machine.

Q. 17. Did you operate this machine to make any butt welds in iron rings in the presence of Mr. Steuart and myself; and, if so, what material did you use, what did you do and what were the results?

A. I welded three rings; all the rings were of steel, two of the rings were of round iron stock three-sixteenths of an inch in diameter

which had been formed into rings five inches in diameter. The larger ring was of one-quarter stock and approximately fourteen inches in diameter. The ends of the rings were clamped into the opposing electrodes; the electrodes were then pushed together until the ends of the rings made contact. The current was then applied and when a welding temperature was attained the ends of the rings were forcibly pushed together, forming an electric weld. These welds were typical butt welds in which one end of the work approached the other end of the work in the welding operation; that is, the two parts of the work were forced together while the material was heated, which action resulted in a burr at the time of welding.

Q. 18. What have you to say as to the quality of these welds?

A. These are good butt welds, as strong as any butt welding I have ever seen. One of the welds in one of the small rings is not exactly in alignment, but on test it would prove to be a fairly good weld. As there is no positive means of alignment in the welding machine it requires a little skill to keep the parts in alignment by eye and I did not make as good a job on one of the small rings as I did on the other small ring and the large ring.

(Plaintiff's counsel offers in evidence the three rings produced in the operation, and the same are marked "Plaintiff's Exhibit No. 45, Ring No. 1, Butt Welded on Machine Like McBerty's, but Having One Turn in the Secondary of the Transformer", "Plaintiff's Exhibit No. 46, Ring No. 2, Butt Welded on Machine Like McBerty's, but Having One Turn in the Secondary of the Transformer", "Plaintiff's Exhibit No. 47, Ring No. 3, Butt Welded on Machine Like McBerty's, but Having One Turn in the Secondary of the Transformer".)

Q. 19. Did you then try to do any spot welding with the machine in the same condition and using the same current as in the case of the butt welding of these rings?

A. Yes.

Q. 20. What did you do and with what results?

A. I welded a number of samples of sheet steel, that is, I tried to weld them. Before welding, however, I placed in the machine two pointed copper rods, allowing them to extend from the terminal clamps about five-sixteenths of an inch respectively. I then



placed overlapping sheets between these two pointed electrodes and after pinching the sheets together by means of the electrodes I turned on the current by depressing the foot switch, allowing the current to flow from one electrode to the other through the work. In one case I overlapped steel sheets of approximately twenty-four thousandths of an inch thick, making two welds or endeavoring to make two welds in the sample; removing the work from the machine the sheets were very easily parted by hand, showing that they were simply stuck together and not welded. I repeated the same experiment on other sheets of the same thickness, in this case making three welds. In this case I did not break the sample apart, but in endeavoring to punch a hole through the sample for labelling purposes the sheets became separated, showing that these were "sticks" instead of welds. I also tried to weld another sample using metal in which one sheet was approximately thirty-one thousandths of an inch thick and the other sheet seventy-one thousandths of an inch thick. In removing the work from the machine the parts fell apart and the effort to weld did not even stick them together.

Q. 21. Please state from your knowledge of electric welding whether, with such a machine delivering the amount of secondary current delivered by this machine, it would be possible to obtain spot welds in thin sheets of metal.

A. Commercially considered I should say no it was not possible to obtain spot welds, but from a theoretical or laboratory standpoint I should say that in thin metal you could produce a very small spot weld occasionally. I have tried my best to secure good spot welds on this machine and have failed, although I believe by making the electrodes very pointed or by throwing them out of alignment that on thin sheet metal an occasional spot weld might be produced.

Q. 22. With the machine in the condition it was this morning and using the same current, would it be possible to produce spot welds such as are present in the "Defendant's Exhibit M" and in the sample Exhibits O and P attached to McBerty's affidavit?

A. It would be absolutely impossible to secure welds of this extent on material of such dimensions as these exhibits with the machine I operated this morning.

Q. 23. With the machine in the condition in which you operated

A. Comparing Figure No. 26, "Peerless adjustable swivel desk fan", on page 197 of the "Electrical Review" of February 9, 1901, and the photograph labeled "G-1", I find them to be identical. I note the maker of the plate is "Manz" in both cases, that both fans are in exactly the same position and that the rivets in the two cuts show up exactly in the same places, that the guard is in such a position that its crossing members come directly in the centre of the ring located on the top of the fan. In fact in every case where I compare the two cuts I see absolutely no difference.

Q. 30. Do you find on pages 196 and 197 other reproductions of Peerless fans?

A. Yes, I find Figure No. 22 is a Peerless standard ceiling fan, in Figure 23, Peerless midget ceiling fan. These two figures are on page 196, and on page 197 I find Figure 24, Peerless trunnion and swivel desk fan; Figure 25, Peerless rigid iron clad desk fan and also the fan which I have just mentioned, Figure No. 26, Peerless adjustable swivel desk fan.

Q. 31. In the cases of all these reproductions of Peerless fans do you find the name "Manz Chicago"?

A. Yes.

(Plaintiff's counsel offers in evidence the number of the "Electrical Review" referred to as "Plaintiff's Exhibit No. 54, Electrical Review of February 9, 1901, pages 196 and 197".)

Q. 32. I show you the February, 1901, number of the "American Electrician". Do you find on page 69 thereof an account of the Ninth Annual Convention of the Northwestern Electrical Association, held January 16, 17 and 18 at Milwaukee, Wisconsin?

A. Yes.

Q. 33. And on page 39 of the same number of the "American Electrician" do you find on page 39 the following:—

"The Warren Electric & Specialty Company of Warren, Ohio, exhibited through the Illinois Electric Company a line of its Peerless fan motors, transformers and lamps. Messrs. L. K. Cushing and C. W. Bacon had charge of this exhibit."

A. Yes.

(Plaintiff's counsel offers in evidence the number of the "American Electrician" referred to, the same being marked "Plaintiff's

Exhibit No. 55, February, 1901, Number of the American Electrician, pages 69 and 39".)

Q. 33a. I show you the February 16, 1901, number of the "Electrical Review", the page on the inside of the front cover showing an advertisement of Peerless fans by the Warren Electric & Specialty Company. What are the designations of the four fans illustrated?

A. A-1, E-1, K-1 and H-1.

(Plaintiff's counsel offers in evidence the number of the "Electrical Review" referred to; the same is marked "Plaintiff's Exhibit No. 56, February 16, 1901, Number of Electrical Review, inside front cover".)

Q. 34. I show you the following numbers of the following magazines, and call your attention to the pages mentioned that show either advertisements or reproductions of Peerless fans: —

"American Electrician", March, 1902, pages 46 and 47, advertising section page 126.

"American Electrician", March, 1903, pages 44 and 45 of the advertising section and page 136 reading section.

"American Electrician", March, 1904, advertising section page 43 and reading section page 135.

"American Electrician", March, 1905, advertising section page 50 and reading section page 140.

"Electrical World", March 24, 1906, advertising section page 46, reading section page 625.

"Electrical World", March 16, 1907, advertising section page 40, reading section page 561.

"Electrical World", March 7, 1908, page 529.

"Electrical World", March 4, 1909, advertising section page 57, reading section page 589.

"Electrical World", March 3, 1910, advertising section page 63.

Please examine these periodicals and the cuts of the Peerless desk fans therein illustrated, and state which of these, if any, show desk fans in which the fan blades are shown as fastened by two rivets to a spider having the shape of the spider, a fragment of which forms part of "Defendant's Exhibit M".

A. On fans shown on advertising section page 46 "American

Electrician", March, 1902, three rivets are distinctly shown in the upper cut. The lower cut is not distinct enough to see the rivets with the exception of those near the centre of the blade. Page 126 of this same issue, Figure 60 shows a Peerless desk fan motor with three rivets. The Peerless fan motors shown on page 44 of the advertising section of the "American Electrician" of March, 1903, shows Peerless desk fans in two of the cuts and in both of these cuts three rivets are shown. On page 136 of the same issue Peerless fans are shown in Figures 75, 76 and 77. In the three cases the fans are shown with three rivets each. "American Electrician", advertising section page 43, March, 1904, Peerless desk fans as shown on this page each blade is provided with three rivets. On page 135 of the same issue Peerless fans are shown, but in all cases three rivets are used for attaching the blades to the spiders. "American Electrician" of March, 1905, page 50 of the advertising section, Peerless fans are shown in which three rivets are used for attaching the blades to the spiders. On page 140 of the same issue Peerless fans are shown, but in all cases three rivets are used for attaching the blades to the spiders. "Electrical World", March 24, 1906, page 47 of the advertising section, the Peerless fan is shown with three rivets attaching the blades to the spiders and on page 625 of the same issue a Peerless fan is shown in which three rivets are used for attaching the blades to the spiders. "Electrical World", March 16, 1907, page 40 of the advertising section shows Peerless fans where three rivets are used for attaching the blades to the spiders and on page 561 of the same issue a Peerless fan is shown with three rivets used for attaching the blades to the spiders. In the "Electrical World", March 7, 1908, on page 529 of the reading section a Peerless fan is shown where three rivets are used to attach the blades to the spiders. In "Electrical World", March 4, 1909, page 57 of the advertising section three Peerless fans are shown, but in all cases three rivets are used for attaching the blades to the spiders. On page 589 of the same issue a Peerless fan is shown where only two rivets seemed to be used for attaching the blade to the spider. For the first time in the examination of the pictures in these magazines the spider itself seems to be of the same general shape as that on the back of the exhibit referred to in your question. "Electrical World" of March 3, 1910, page 63 of the adver-

tising section shows Peerless fans where two rivets are used for attaching the blades to the spiders. The spiders themselves seem to be of the same general shape as the spiders you referred to in your question, that is, spider used on the back of "Defendant's Exhibit M".

(Plaintiff's counsel offers in evidence the periodicals above referred to, and the same are marked: "Plaintiff's Exhibit No. 57, American Electrician, March, 1902"; "No. 58, American Electrician, March, 1903"; "No. 59, American Electrician, March, 1904"; "No. 60, American Electrician, March, 1905"; "No. 61, Electrical World, March 24, 1906"; "No. 62, Electrical World, March 16, 1907"; "No. 63, Electrical World, March 7, 1908"; "No. 64, Electrical World, March 4, 1909"; "No. 65, Electrical World, March 3, 1910".)

Cross Examination.

By Mr. STEUART.

×-Q. 35. Referring to the turbine blade Exhibit No. 42, from what did you determine the size, the breadth and depth of the cuts formed in the ring?

A. I read the deFerranti provisional specification and that suggestion combined with my knowledge of the art of electric welding caused me to decide on the dimensions of these cuts. I knew that Ferranti wanted to produce a weld which must be strong enough to withstand the centrifugal force exerted by a rotating steam turbine and I made the welds as strong as possible with that end in view. I was careful not to remove sufficient metal to interfere with Ferranti's object. Ferranti tells us "the object to be kept in mind in this as in other modifications is to remove sufficient metal to enable the temperature to rise to the welding point as explained above, while at the same time leaving sufficient areas untouched to insure due mechanical strength in the welded joint".

×-Q. 36. I understand that in Exhibit No. 44 the turbine blade was reduced in length about one-eighth of an inch, so that before the welding operation it was one-eighth of an inch shorter than the unwelded blades in Exhibits Nos. 42 and 43; is that correct?

A. Roughly speaking, yes.

×-Q. 37. I now notice that in the welded Exhibits 42, 43 and 44

the blade of Exhibit 44 is longer than the blades in Exhibits 42 and 43. What has become of the greater length of blades which initially existed in the blades of Exhibits 42 and 43?

A. Your question as to what has become of the extra length on the samples 42 and 43 is easily answered by an inspection of the samples. A burr has been formed which consists of the upset of the blades.

X-Q. 38. As I understand the matter, in a resistance welding circuit the initial heating and the maximum heating effect occurs primarily at the point of greatest resistance in the circuit; is that correct?

A. Yes.

X-Q. 39. What determines the current-carrying capacity in an electric resistance welding circuit, the cross-sectional area of the conductor or the superficial surface area?

A. Both play an important part in the current-carrying capacity of the conductor. The cross-sectional area has to do with the resistance of the material and the surface measurements have to do with the radiating of the heat of the conductor. If a small area has a large radiating area it may conduct the same current for the heating effect as a large cross-section with a small area.

X-Q. 40. I do not know that I understand the answer. I would ask you that if I reduce the cross-sectional area and increase the superficial surface area at any given point in the circuit I can still carry through that circuit the same quantity of current without changing its resistance?

A. Theoretically, the current flowing through a body and its resistance, providing we consider only these two factors, have nothing whatever to do with each other except insofar that if the temperature of the body is altered by an increase in current there is a slight change in resistance. Does this answer your question?

X-Q. 41. No; I understand your former answer to be that the superficial surface area and the cross-sectional area were both factors in determining the current-carrying capacity in the circuit. I now wish to know if I can reduce the cross-sectional area and at the same time increase the superficial surface area and still maintain the same current-carrying capacity?

A. My answer is yes. It probably may be that you and I do

not both mean the same by the term "current-carrying capacity". According to my definition of current-carrying capacity I mean the ability of a conductor to carry a current without overheating, the overheating being determined by the purpose for which the conductor is to be used.

×-Q. 42. The resistance in the circuit is increased, however, is it not?

A. If you alter the sectional area through which the current flows, you at the same time alter its resistance.

×-Q. 43. When you increase its resistance by reducing the sectional area you thereby increase the heating effect at that point, do you not?

A. Generally stated, yes.

×-Q. 44. Is there any qualification of that; if so, what?

A. I cannot think of any qualification at the present time.

×-Q. 45. If I reduce the cross-sectional area of a conductor, say a round conductor, while still maintaining its round form, do I reduce or increase its heat radiating capacity?

A. You take a round conductor such as a wire and reduce it in diameter, you necessarily reduce its surface area, you therefore reduce its radiating properties, provided, however, you maintain the original current.

×-Q. 46. Then it is a fact, is it not, that when I make a pointed welding electrode, thereby reducing the diameter of the electrode while maintaining its cylindrical form — while maintaining its circular form in cross-sectional — I thereby increase the resistance to the flow of current and also reduce the radiating capacity; is that correct?

A. From a theoretical standpoint you may be correct in a very microscopic sort of a way, but the added resistance is so very slight that from a commercial standpoint it can be absolutely neglected. Also the amount of radiation which you have altered by tapering the end of an electrode is so very slight that its effect on the circuit and on the current flowing is practically nothing; that is, if you would have an ammeter in the circuit with a straight flat conductor and then cut a portion of this conductor to imitate the shape of a welding electrode, it would take very delicate instruments to detect any change in the amount of current flowing; in fact, even



with delicate instruments the alteration in current would hardly be indicated.

X-Q. 47. Why is that?

A. Because a welding circuit is of considerable length all told and you are only operating on a very small length of this, so that the alteration in this small amount of resistance would hardly be noticeable.

X-Q. 48. I hardly think I understand your answer, but I assume that you mean if we have a straight cylindrical conductor, say of the size of the usual cylindrical welding electrodes, and we reduce the diameter at some particular point, to say the diameter of the contacting faces of the usual electrodes, we will not thereby increase the resistance of the circuit sufficiently to be noticeable; is that correct?

A. That is correct. The idea is that resistance depends on two factors, one of which you have entirely failed to consider. Resistance depends on the area of the circuit and its length. You have reduced your conductor for such a short length that the changing in its resistance would likewise be very small.

X-Q. 49. By this, expressed another way I take it, that you mean that the smaller but unbroken portion of the circuit under these circumstances has a sufficiently greater current carrying capacity in any given case to let that current pass without being affected by the increased resistance and without producing any particular heating effect; is that correct?

A. I understand you to say the circuit is unbroken. I do not remember having said anything about the heating effect, but you seem to understand me all right. If I make the further explanation that heat is, or tends to be, produced where you reduce your current section, and in case we are speaking now of copper conductors all told, the heat conducting properties of the copper will dissipate or conduct away from the high resistance point most of the heat that is formed there so that the conductor can carry what might be called a tremendous overload, even though it has a high resistance, because the surrounding copper will conduct the heat away from the spot tending to get hot very rapidly. We see examples of this in the specifications for fuses. A fuse must be of sufficient length so that its central portion will not be thermally



affected by the characteristics of the massive terminals through which the fuse is attached. In this case the fuse is of relatively high resistance, and is designed to get very hot on a slight overload, but if the fuse is too short it will not get hot owing to the fact that the heat is conducted quickly into the terminals which hold the fuse in place, and consequently the fuse does not blow at its rated capacity.

×-Q. 50. Then I take it that in electrode welding the tapering of the points of the electrodes has quite a modifying effect, that is to say, if they are very blunt they will conduct the heat away from the welding point very much quicker?

A. That is correct; the amount of heat conducted between the so-called blunt taper and a more delicate taper used for welding is noticeable, but not especially great.

×-Q. 51. In spot welding is the cross-sectional area of the circuit increased or decreased by the overlapped plates placed between the electrodes?

A. At one time it was considered that the current would spread out and pass through the broad sections of the overlapping plates, therefore if the plates were overlapped more than the contact area of the electrodes the circuit would entirely fill up the plates, and this would tend to enlarge the circuit at that point. At the present time, however, spot welding seems to have taught us that the current does not spread out through all of the plates but passes directly through the plates from one electrode to the other, continuing in its slender path, the size of which is governed by the contact area of at least one of the electrodes. In case the overlap is larger than the end of the smallest electrode it does not seem to have any influence on the sectional area of the current as it passes through the work. That is, after we have lapped the sheets sufficiently so that the tools do not approach the edges of the sheets we can increase or diminish the overlap without in any way affecting the sectional area of the current as it passes through the work.

Mr. STEUART. Objected to as not responsive to the question.

A. My answer is in accordance with my understanding of the question. I will ask you to put your question in slightly different words if I do not seem to have answered it.

X-Q. 52. Is that the best answer you can give?

A. I understand your question to say, is the sectional area of the circuit increased or diminished by the amount of overlap of the work. The whole question seems to depend on our definition of circuit. My definition of circuit is that through which the current flows, and if the current does not flow through the entire sheets surely the circuit is not increased or decreased by the amount of overlap in the sheets, providing the sheets are sufficiently overlapped to take the path provided by the pointed electrodes.

X-Q. 53. Then I understand your theory to be that we can disregard insofar as the conductor through which the current flows is concerned all those parts in the overlapped sheet which are outside of an area equal to that defined by the contacting faces of the electrodes with the plates; is that correct?

A. No, that is not correct, and I do not remember having made a remark to indicate that.

X-Q. 54. I understand your theory to be that current does not flow except in the restricted area defined by the electrode. If I misinterpret your answer, please explain it.

A. You are correct in that. From a practical standpoint the current stays in this path; there may be current in other parts of this sheet, just as they say there are parts of our atmosphere in the sun.

X-Q. 55. Will you now tell me what the cross-sectional area of a rod one-quarter of an inch in diameter is?

A. Less than one-sixteenth of a square inch; about one-twentieth of a square inch.

X-Q. 56. The "Plaintiff's Exhibit No. 50", then, has about that cross-sectional area at the ends that are welded together?

A. Yes.

X-Q. 57. Now, what is the area of the contacting faces of the electrodes "Plaintiff's Exhibit No. 52"?

A. They are one-eighth of an inch in diameter; about one-eightieth of a square inch.

X-Q. 58. In your direct examination you have referred to a difference which I do not quite understand; I would like to have you explain what the difference is between what you term a "stick" and a weld. You referred several times to plates being stuck

together and other plates being welded together; I wish to know what the distinction is?

A. The practical distinction is that the plates are very easily separated in a "stick" without tearing the surfaces or pulling the fibre of the metal apart. In the case of a weld the metal does not break along the plane surface as in the "stick" but across a jagged surface, showing that the metal has been intimately connected, or as we term welded.

X-Q. 59. Do you mean that the metal is reduced to that state of fluidity in welding where the two metals of the two parts to be united intermingle or flow together as distinguishing between what you term a weld and a "stick"?

A. In a weld the metal has been raised to a sufficient temperature to make it waxy or soft, and in this state we know that the two bodies placed together will cohere; but when the metal has not been raised to a sufficient temperature to produce this welding condition it may "stick" together to some extent, probably due to the fusing of oxides on its surface, and it is simply stuck together, not intermingled as when the temperature is high enough for the welding.

X-Q. 60. Have you ever watched a weld being made and seen the metal boil and bubble at the welding point, in some cases actually running away from the welding point?

A. I have seen metal raised to this temperature, but this is much higher than is required in welding. Sometimes we say the metal seems to flow when a blacksmith welds, but if the metal is flowing it is simply on the surface, as surely a blacksmith could not pick up a melted bar. If you refer to blacksmiths' welding, I have no doubt you have mistaken the flowing of the flux which the blacksmith puts on.

X-Q. 61. I have said nothing about blacksmiths' welding. I am perfectly familiar with that process and what takes place; I am now asking about electric welding, and you may confine your answers to that. Have you ever examined the process of welding, butt welding if you please, through colored glasses, and you could see the action without your eyes being so affected by the light that you could not see the actual condition of the metal?

A. Yes, I have viewed welding through colored glasses.

×-Q. 62. Did you not then observe the metal turned into a fluid condition at the weld?

A. Not in every case; the cases were unusual where I observed it.

×-Q. 63. Was such a condition produced, namely, was any of the metal reduced to a fluid condition in the welding of Plaintiff's Exhibits Nos. 42 and 43?

A. I would not say that the metal was reduced to a molten state, because I am the one who welded the sample and I had my hand on the operating lever and applied considerable pressure and would have known immediately had the metal melted, for in that case it could not have withstood the pressure and I would have felt this effect. I would not say that the metal had melted in these samples Nos. 42 and 43.

×-Q. 64. And in sample No. 44 still less of this melting effect, I take it, occurred?

A. I did not say anything about that such an effect took place, therefore I cannot admit that less took place than in sample 44.

×-Q. 65. How about the Plaintiff's Exhibits Nos. 48, 49 and 50?

A. The burr on these samples show that the metal did not melt; it was, however, very hot, especially in the larger ring. I also had my hand on the operating levers in this case and would have immediately noticed it had the metal in contact become liquid. This effect would be communicated to me by the feeling of the levers, on which I always maintained at least a little pressure.

×-Q. 66. I show you now one plate of a sample which you saw me weld this morning and which corresponds in thickness to Plaintiff's Exhibits Nos. 48 and 49, and would ask you if that shows a weld or a stick?

A. In most cases it shows a stick; there is, however, an indication of a very small weld in the centre of the stick.

×-Q. 67. Do you find any evidence of such a weld in any of the Plaintiff's Exhibits Nos. 48, 49 and 50?

A. No, I do not.

×-Q. 68. How long did you leave the current on in making these samples?

A. I will have to guess at this; I remember that we were leaving it on a long time for a spot weld; I would estimate seven or eight seconds, probably ten.

×-Q. 69. Does it make any difference in the time because of the thickness of the metal?

A. I think we left them all on a long time; we probably left the larger samples on longer than the thinner samples. The point I wish to make is no matter how long we left the current on it is very improbable that we would ever have gotten a spot weld.

×-Q. 70. Do you mean actually a spot weld or do you mean what you have termed a commercial spot weld?

A. I do not believe we would ever get a spot weld which would be theoretically called a weld, certainly not a commercial spot weld.

×-Q. 71. How long did you ever leave the contacts on in that particular machine?

A. I think the longest I ever left the contact on was three-quarters of a minute on sheets that were approximately one-thirty-second of an inch thick.

×-Q. 72. Did you ever leave it on long enough to fuse a hole in a thin sheet?

A. It would be impossible to fuse a hole even on a thin sheet in that machine.

×-Q. 73. Would it be possible to fuse the ends of rods one-eighth of an inch in diameter such as the two small rings welded?

A. You had the exhibits this morning to answer that question. You could certainly fuse the ends of rings one-eighth of an inch in diameter; the metal would drop out and melt.

×-Q. 74. What is the distinction which you draw between a theoretical spot weld and a commercial spot weld?

A. One could be used in commerce and the other could not; one is a certain factory operation and the other is a laboratory experiment.

×-Q. 75. I mean the physical differences.

A. If a spot weld was too small to be of commercial use, I would not say it would be a spot weld.

×-Q. 76. How small would it have to be to be too small to be of commercial use?

A. The welds you made on the machine this morning certainly would not be of much commercial use, if any commercial use, from the material you welded, because you easily broke it apart with your fingers.

X-Q. 77. I call your attention to the weld that I made and pulled apart before it broke, bent one corner of the metal plate, doubled back on itself and then broke; does this change your view?

A. Not the slightest.

X-Q. 78. You have referred to the possibility of using the machine you were working with this morning for the heating of rivets; would it in your opinion make any difference whether or not those rivets were driven tightly in the holes or fitted the holes loosely?

A. It would be to the advantage of the machine for the rivets to fit the holes loosely; in order to get a rivet into the work it must be smaller than the hole and therefore in commercial working the rivet really does not touch the sides of the holes to any great extent; there is an air space there which breaks the continuity of the metal and therefore interferes to greater extent with the conduction of heat. If the rivet was driven tight and in firm contact with the metal of the surrounding hole, it is very doubtful if the machine would heat such a rivet throughout.

X-Q. 79. In spot welding with commercial machines I notice that the electrodes are clamped on the work and immediately prior to the cutting off of the current the electrodes always advance very slightly; is this in accordance with your observation?

A. Yes; but the observation has to be very acute in ordinary thin work to notice that the spot welding is done correctly; take for example sheets .0014 of an inch thick, in case the electrodes would advance .0028 of an inch, which is a very small amount, they would be entirely through the sheets. But in welding this kind of work and then calibrating it afterwards we notice that the electrodes move not more .002 or .003 of an inch and if your observation has seen .002 or .003 of an inch at a distance from an electrode you have very fine observatory powers. There is I admit an advance of the tools to a slight extent, but I fail to agree with you that it is always noticeable.

X-Q. 80. And this reduces the thickness of the stock at the weld to the same extent that the electrodes advance, does it not?

A. There is a very slight thinning of the work at the weld in some cases.

X-Q. 81. In other words, the work is pressed more intimately in contact at the welding point?

A. No, I do not think it is pressed into any more intimate contact from a physical standpoint; that is, the work is in contact all over and the whole section through which the current passed is condensed, due to the welding pressure. There is no doubt but the work is pressed into intimate contact at the weld from a molecular standpoint, but from a pure physical ordinary standpoint it is in contact throughout the overlapping portions; even the pressing of the work with a tool like hitting it with the ball end of a hammer is very similar to what is produced when the welding is done correctly.

X-Q. 82. Do you agree to the scientific theory that you cannot put any pressure on one side of a plate of metal without producing a bulge on the other side?

A. No, I do not agree if you hit a slab of steel one inch thick with the ball end of a hammer that you put a corresponding bulge on the other side.

X-Q. 82a. Suppose you maintain the pressure?

A. No, I do not agree with the scientific theory, because I have in mind pressing the metal in a die without causing any deformation on the other side of the metal, however; for instance in the manufacture of coins.

X-Q. 83. Referring to "Plaintiff's Exhibit Electrical World of March 4, 1909", Exhibit No. 64, page 589, what cut did you refer to on that page as showing a spider corresponding to "Defendant's Exhibit M"?

A. The cut labeled "Peerless Universal Fan".

X-Q. 84. What part of the spider can you see in this cut?

A. The central portion and the beginning of the arms.

X-Q. 85. What is the shape of the arms?

A. The arms as far as they go seem to be of the same shape as the arm of Exhibit M.

X-Q. 86. How does the part of the spider shown in the cut on page 589 differ from the part of the spider shown at the lower right-hand corner of page 57 of the advertising section of this same exhibit?

A. The spider in the Peerless Universal Fan, page 589, has but two rivets, whereas the spider of the fans shown on page 57 of the advertising section has three rivets and the spider of the lower



right-hand fan on page 57 has a pronounced hub extending towards the observer, whereas this extension on the other fan on page 589 is not nearly so pronounced.

×-Q. 87. My question was addressed to the difference between parts of the spider that are shown in these cuts and not to what you deduce is the form of the spider from the number of rivets; will you please answer the question with that understanding?

A. The hub of the spider on page 57 of the advertising section is very well pronounced, extending towards the observer. The hub of the spider on page 589 does not seem to have this well pronounced hub extending toward the observer.

×-Q. 88. And you think that is characteristic of the two-rivet spider?

A. I do not know that the hub part is especially characteristic of the two-rivet spider; you simply asked me to compare these two figures and I have pointed out the difference in the spiders. You have told me not to consider anything that I cannot see, to disregard the two or three rivet holes.

×-Q. 89. Then, so far as the cut illustrates the spider itself, that is the sole reason that you think it resembles "Defendant's Exhibit M"?

A. Yes, it has that flat appearance which seems to be present in the Exhibit M.

×-Q. 90. Then, as I understand it, your reasons are based on this flat centre and the presence of two rivets instead of three?

A. Yes.

×-Q. 91. Will you now please look at the lower right-hand cut in "Plaintiff's Exhibit Electrical World, March 3, 1910", which has a two rivet connection with the spider, and tell me if you find there shown a hub at the centre?

A. Yes; but this hub does not extend toward the operator to any extent. I am familiar to some extent with electric fans and can see in this fan that the spider itself is flat and I know that if this fan was turned 90 degrees the hub would not seem to extend out from the spider to any extent. It is practically flat.

×-Q. 92. Have you ever noticed any commercial spot welds that break apart, showing what you have herein termed an example of sticking rather than a welding?



A. I have known spot welds which ought to have been commercial welds to come apart, but the fact that they did come apart showed that they are not commercial or valuable.

×-Q. 93. Is the cause of failure to make those welds ever due to failure to leave welding current on for a sufficiently long length of time?

A. This seldom happens because commercial welding is done very quickly, — the current only being left on a very short time, sometimes only a fraction of a second. A spot weld is one which unless the work welds very quickly it is not likely that it will weld at all. Answering your question definitely, it is my opinion that it seldom happens that a weld is defective because the current is not left on long enough.

×-Q. 94. Does it ever happen?

A. I do not know. I would imagine that sometimes it might happen.

Redirect Examination.

By Mr. STACKPOLE.

RDQ. 95. Assuming that in the McBerty machine the secondary delivered four volts to the welder and in the machine which you operated this morning the secondary delivered one volt to the welder, what is the ratio of the heating effects of the two currents?

A. If the voltage was increased four times with the same work, electrodes, etc., the amount of current would be increased four times; that is, if we multiply the voltage by four, the current would be increased four-fold; now, as the heating effect depends on the square of the current and there is four times as much current flowing, the heating effect would be sixteen times as great.

RDQ. 96. Mr. Steuart has shown you a sample which he made this morning showing a very minute weld; how does it happen this sample showed such a weld and the samples made by you do not show such a small weld?

A. It is almost impossible to say; he may not have had his electrodes in alignment; this is simply a personal matter with the machine, because as I have testified before there is no means in the machine to secure the alignment of the electrodes, and in case there was a small speck of metal directly between the sheets at this point

to greatly concentrate the current of a speck of rust may have interfered with the passage of the current so as to produce a heating effect which would just turn the tide sufficiently to produce the minute weld.

Recross Examination.

By Mr. STEUART.

*R* × *Q*. 97. How many welds did Mr. Steuart make?

*A*. I do not seem to have remembered. I think it was only one, it may have been two.

*R* × *Q*. 98. Did not he attempt to make one weld and the electrode on the right-hand side of the machine slipped out of place and then you clamped the electrode tightly and he made one more weld about which you have been testifying?

*A*. I think that is correct.

*R* × *Q*. 99. Did he not state that it was the first time he ever tried to obtain a weld?

*A*. Yes.

*R* × *Q*. 100. Have you any reason to doubt that?

*A*. I have not.

(Signature and certificate waived.)

Adjourned to further notice.)

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FINDLAY, OHIO, July 25, 1919, at 3 P. M.

Met pursuant to agreement of Counsel.

Present: J. L. STACKPOLE, of Counsel for Plaintiff;

A. S. PATTISON, Counsel for Defendant.

(Counsel for plaintiff offered in evidence the 1907, 1908 and 1910 catalogues of the Peerless Electric Company of Warren, Ohio, and the same are marked, respectively, "Plaintiff's Exhibit 66, Peerless 1907 Catalogue", "Plaintiff's Exhibit 67, Peerless 1908 Catalogue", and "Plaintiff's Exhibit 68, Peerless 1910 Catalogue".)

Plaintiff's counsel states that he has been unable to obtain possession of the catalogues of the Peerless Electric Company for the years 1905, 1906 and 1909, and calls upon the defendant, if it possesses copies of those catalogues to produce the same.

405 Plaintiff's counsel also requested the defendant to furnish plaintiff photographic copies of all the pages describing desk fans, or illustrating desk fans, in the defendant's exhibits, which are catalogues of either the Warren Electric & Specialty Company or of the Peerless Electric Company, with the exception of the catalogue of 1902, of which plaintiff's counsel has a copy.

Mr. Pattison. Defendant's counsel replies that defendant has no Warren Electrical & Specialty Company or Peerless Electric Company catalogues other than those that have already been offered in evidence.

(Certificate waived by agreement of counsel.)

Boston, Mass., August 6, 1919—10 a. m.

Met pursuant to agreement of counsel.

Present: J. L. Stackpole, Esq., Counsel for Plaintiff; A. S. Pattison, Esq., Counsel for Defendant.

*Second Deposition of Thomas Howe.*

Direct examination.

By Mr. Stackpole:

Q. 1. Are you the Thomas Howe who has already testified in this case?

A. I am.

Q. 2. Have you read a copy of the deposition of F. P. McBerty recently given at Warren, Ohio?

A. I have.

Q. 3. In that deposition Mr. McBerty has stated that he went with you to the plant of the Peerless Electric Company to assist in a search for any spot welded fan blades that you could locate, and that this search occurred during your investigation of the evidence of his alleged 1901 spot welding. Did you make such a search?

A. No.

Q. 4. What circumstances were there in connection with your investigation of this matter which enables you to testify that you did not make such a search?

406 A. I recall very distinctly the circumstances of my going to the Peerless Electric Company with Mr. McBerty. He had told me that a number of people whom he knew and who were employed at the Peerless Electric Company might be able to give us some testimony as to his use of electric spot welding. We went to the Peerless Company to see these men. When we arrived at the Peerless Electric Company, Mr. McBerty and I were taken up to the office of the president of the company and he sent out for two or three men that Mr. McBerty thought might recollect something about the spot welding. After we had interviewed these men in the office of the president of the company we left the building, and in passing out we went through various rooms and from time to time spoke to people who seemed to be known to Mr. McBerty. If

I was ever in a store-room or stock-room of the Peerless Electric Company I was unconscious of it. Possibly some of the rooms that we passed through in going in or coming out might have been a store-room or stock-room, but, if so, I did not know it. Certainly I was not looking for any spot welded fans or fans of any kind, because Mr. McBerty, as I have previously testified, had told me that no fans with spot welded blades had been built, and I certainly was not looking for something which I thought was not in existence. My recollection is further fortified in making this statement because of the fact that the affidavits say nothing about the production of fans with spot welded blades. I was in Warren for the purpose of getting the facts in regard to any early spot welding by Mr. McBerty for use by a defendant, and I was keenly alive to the value of any production of fans and particularly their going into commercial use if such fans had spot welded blades. I am therefore positive that if Mr. McBerty had ever told me that he had produced such fans that I would have put it into the affidavit. The fact that it is not in the affidavit absolutely confirms my recollection that I didn't know of any fan with spot welded blades, consequently couldn't have been looking for it anywhere, and consequently was not looking for it at the Peerless Company and had no reason for being in the stock-room.

Q. 5. In the same deposition Mr. McBerty had testified that although he told you that he had made some spot welded blades that went into commercial fans the mention of this fact was left out of the affidavit because you had no tangible evidence of such  
407 work and could not locate such a fan or positively identify it. Do you agree with this statement of Mr. McBerty?

A. I do not. As I have testified, I cannot conceive that with my keen appreciation of the value of such a fact I could have said anything of the kind or intimated it.

Q. 6. Were the affidavits collected by you taken for use in court or for what purpose?

A. I was sent out by Mr. Edwards to get the facts as to the alleged use by Mr. McBerty of spot welding so that he might judge of the value of the proposition as a defence in the Barney & Berry suit. The statements were taken in the form of affidavits because it was believed in this way the statements would be given more serious consideration, and further that if given in the form of affidavits the statements would be in more fixed form so that it would be accurately known what could be depended upon in the way of testimony if it should be decided to present the matter in the suit.

Q. 7. In the same deposition Mr. McBerty has testified that the call you and he made on Mr. McDonald was very brief, and the interview as to the electric welder and spot welded blades did not cover a period more than three or five minutes. What have you to say as to this matter?

A. I do not at all agree with what Mr. McBerty says, as you have stated. Mr. McDonald lived at a considerable distance outside of Warren; as I recollect, it was stated to me in Warren, and I think by Mr. McBerty, that the distance was about eight miles. We went out there in an automobile and talked the matter over with Mr. McDon-

ald, and used every effort to stimulate his recollection by suggesting things both by Mr. McBerty and myself which we thought would refresh Mr. McDonald's recollection. This I am sure occupied a much longer time than you stated in your question, and I am very sure that I would not have taken the trip as I have stated without getting everything that I thought could be obtained, and apparently Mr. McBerty was helping me all he could to do it.

Q. 8. What did you do about obtaining a statement from Mr. McDonald?

A. I prepared an affidavit for him, but there was no notary out in the country where he was before whom it could be executed, so I gave it to Mr. McBerty with the understanding that the next time Mr. McDonald came to town he would execute it, then Mr. McBerty was to send it to me in New York.

Q. 9. Did you ever receive the McDonald affidavit from Mr. McBerty?

A. I did not.

Cross-examination.

By Mr. Pattison:

X Q. 10. Did you meet the president of the Peerless Electric Company on the occasion of the visit referred to by you?

A. I believe it was the president; it was one of the officials of the company. It is my recollection now that it was the president; however, it was one of the officials who had a private office and I should say he was the president of company.

X Q. 11. Do you recall his name?

A. I don't recall his name now; I do remember, however, that Mr. McBerty told me that he was formerly a mayor of the town or city of Warren, Ohio.

X Q. 12. Was his office in the front of the building?

A. I believe it was; I know that we went a rather round about way to get to it as it seemed to me, but after we got there, as I recall, we could see out into the street, so I conclude it was on the front of the building.

X Q. 13. Did you enter the building from the front?

A. Yes, I think so; it was the door which appeared to be the main entrance opening out on to the street.

X Q. 14. Was the office to which you went on the first or the second floor of the building?

A. It was not on the first floor; I believe it was on the second floor, but it might have been on the second or third floor; I know we went upstairs.

X Q. 15. Do you recall the employees of the company that were brought into the room for you to talk with about the spot welding?

A. I think one was named Estabrook and his first name was I believe David, with a middle letter R. I believe also there was a man by the name of Bean. That is all as I remember now.

X Q. 16. Don't you recall that on reaching the president's room

you entered the building from the front into a hall, went  
409 the stairs to a hallway on the second floor and from this hall-  
way into the president's room, which as you say was located  
on the front of the building?

A. That sounds as if it might be a correct description of our course.

X Q. 17. Then you recall only two employees of the Peerless Com-  
pany with whom you talked on this occasion?

A. I don't now recall the names of any others.

X Q. 18. Do you recall that the president's name of the Peerless  
Electric Company was Ward?

A. It seems to me that it was, but I wouldn't like to say positively.

X Q. 19. I suppose you were introduced to this officer of the Peerless  
Electric Company, whoever it was that you met there?

A. Yes.

X Q. 20. I understand you are not sure whether it was the president?

A. I believe it was the president; I think Mr. McBerty told me  
that he was the president.

X Q. 21. Do you recall on which side of the hallway the office  
was located?

A. That is another thing which I wouldn't like to say with abso-  
lute positiveness, but it seems to me that in going into his room  
I turned to the right.

X Q. 22. You were walking towards the street and turned to the  
right into his office?

A. The directions are getting a little bit too minute for me to  
remember. As I said before, we went through a number of hallways  
and rooms upstairs and to tell just what direction I turned at any  
particular point is rather hard to do.

X Q. 23. Did you make more than this one visit to the Peerless  
Electric Company with Mr. McBerty while you were investigating  
this spot welding proposition?

A. I only made one visit to the Peerless Company with Mr. McBerty.

X Q. 24. Did you visit the Peerless Electric Company at any time  
without Mr. McBerty?

A. After we had interviewed the men, as I have stated, I  
410 went back to Mr. McBerty's office and prepared affidavits.  
Then I believe I went by myself to take those affidavits up to  
the Peerless Company to have them executed.

X Q. 25. Whose affidavits did you take up to the Peerless Com-  
pany for that purpose?

A. As I say, I recall two of the names, Estabrook and Bean; there  
might have been others, but I do not recall any of the names now.

X Q. 26. Did they execute the affidavits at the Peerless Electric  
Company?

A. That is my recollection.

X Q. 27. Did you take a notary out there with you?

A. I don't remember doing that.

X Q. 28. Then how were the affidavits executed at the Peerless  
Electric Company?

A. I don't remember whether the notary was somebody in the Peerless works, or whether he came in from outside.

X Q. 29. Did you ever visit the Peerless Electric Company on any other occasion except these two which you have mentioned?

A. I never visited the Peerless Electric Company except at this time of my visit on the McBerty matter in the fall of 1913, and I don't think that I was at the Peerless Company other than the times I have stated.

Deposition closed.

Signature and certificate waived.

Boston, Mass., August 20, 1919—10.30 a. m.

Met pursuant to agreement of counsel.

Present: J. L. Stackpole, Esq., Counsel for Plaintiff; Melville Church, Esq., Counsel for Defendant.

*Sixth Deposition of James H. Gravell.*

Direct examination.

By Mr. Stackpole:

Q. 1. Are you the James H. Gravell who has already testified in this case?

A. Yes.

Q. 2. Have you at my request made a search for a G type of desk fan made by the Warren Electric & Specialty Company in the year 1901, as described and pictured — the catalogue of that company for that year?

A. Yes.

Q. 3. Please state the circumstances of your search for such a fan. A. I really commenced looking for a fan (that is, a G fan made by the Warren Electric & Specialty Company in 1901) as soon as I discovered that such a fan was of interest in this suit, and have really been looking for this fan for over a year. When you made a request that I try to secure such a fan, I put considerable attention to the search and went all over New York City, that is, all over the parts where I thought one of these fans could be secured. I directed my attention mostly to Center Street and the adjacent streets where the second-hand stores are located. I called at these stores personally, made inquiry regarding the fan in question, and also went through the stock of fans on hand at each one of these second-hand stores. I was unable, however, to locate any of the fans in New York City. I next directed my search to Philadelphia, and called at many secondhand fan stores in that city. I took my automobile and went up and down the various streets where the old second-hand stores and junk stores were located, and examined many fans in these old second-hand and junk stores, but entirely failed to locate any G type fans. I then got in touch with the Electric Salesmen Association, and through Mr. Goeforth interested the



men who sell electrical supplies throughout the State of Pennsylvania, requesting them to secure one of these fans, if possible. Mr. Goeforth finally advised me that, although the ones he had spoken to had made a diligent search all up through the State of Pennsylvania, they were unable to find a fan meeting with my description. I had almost given the search up when it occurred to me that some private parties might still have one of these fans in operation; so I remembered reading in one of the electrical magazines of 1901 that many fans of the Peerless make had been sold to various firms on Chestnut Street between Broad Street and the Delaware River. I therefore decided to call on the old established firms in hopes that I might locate a fan. I started in at Broad and Chestnut Streets, and I believe went into every store in succession, and examined what fans I had access to. I also called at the Continental Hotel, an old established hotel in Philadelphia, and interested their engineer in trying to find a fan for me, but without avail.

After visiting many stores I came to J. B. Shannon Hardware Company's store, 814 Chestnut Street Philadelphia, and walked through their store, but no Peerless fans were in sight. I then went on to the further part of the store and into one of their back offices, and there on a shelf above a bookkeeper's desk I noted a fan which seemed to exactly agree with the disclosures in the 1901 Warren Electric & Specialty Company's catalogue. I asked the bookkeeper to permit me to examine the fan, which permission he granted. I borrowed his stool and thoroughly inspected the fan. A closer examination seemed to indicate that it was the fan I wanted. I then went into the store proper and purchased a small horse-shoe magnet, so that I could test the blades to see if they were of steel. Having satisfied myself that they were of steel, I got in touch with the manager and purchased the fan. This fan I brought to Boston, and it is the fan in my presence at the present time, in exactly the same condition in which I bought it. The fan was in running condition at the time I made the purchase.

Q. 4. Please produce the fan in question.

A. I here produce the fan in question.

(Plaintiff's counsel offers the fan produced by the witness in evidence as "Plaintiff's Exhibit 51, Fan Purchased by Gravell".)

By Mr. Church: Objected to as incompetent, irrelevant and immaterial.

Q. 5. Is the fan Exhibit 51 exactly in the condition in which you first saw it at the store of J. B. Shannon in Philadelphia?

A. It is in exactly the same condition. I might add that the string now attached to the top has been placed there by me in order for me to carry it, and the electric wires running to the fan were disconnected from the fan when I made the purchase.

Q. 6. Please compare this fan, Exhibit 51, with the cut of the G-1 fan shown in the 1901 and 1902 catalogues of the Warren Electric & Specialty Company.

A. The catalogue which I hold in my hand is a 1902 Peerless catalogue, and I remember distinctly that the same cut of this fan



is also shown in the 1901 Warren Electric & Specialty Company's catalogue, the two cuts being, as far as I possibly can tell, made from the same photograph and therefore identical. My remarks pertaining to the 1902 catalogue of the Warren Electric & Specialty Company would likewise pertain to the 1901 catalogue. Comparing Exhibit 51 with the cut G-1, I find them to be identical. The base has the fluting and the fan is of rigid construction, that is, there are no adjustments for turning the fan in various positions. The cut of the G-1 fan indicates blades with three rivets, and I note these three rivets are in the Exhibit 51. Referring to the guard, the cut shows a central ring connected to the outer rings by a number of wires. These wires have the same shape, and in both the cut and Exhibit 51 the number of the wires is the same. The cut shows an eyelet at the top of the fan, which is evidently missing in Exhibit 51, because I note in our Exhibit 51 a hole is provided for screwing in this eyelet. I asked regarding this when I purchased the fan, and they could tell me nothing about it. It therefore has evidently been lost during the life of the fan. I remember in the testimony and in, I believe, the 1901 catalogue the fan in question had but a single speed, and I note that Exhibit 51 has but a single speed. The cuts of the G-1 indicate a solid sort of a spider, which has all the appearances of being cast. Exhibit 51 has a cast brass spider. The cuts indicate four arms for holding the spider to the motor case. In our Exhibit 51 but two of these arms remain, that is, the upper two. The lower two have been lost. The reason I say this is because the provisions at the bottom for screwing on these arms are present in the motor case. Flats have been provided for seating these arms on the motor case, and holes have been provided for attaching these arms with screws. The cuts of G-1 show a center mark in the center of the armature shaft. This center mark is also present in our Exhibit 51. When the fan constituting our Exhibit 51 is set in a similar position to the view shown in the cuts of the fan the exhibit and the cuts exactly agree in every detail. The cut labelled G-1 in the Peerless catalogue of 1902 seems to indicate that there is a name plate on the top of the fan. This name plate is also missing in our Exhibit 51. I also made inquiry from J. B. Shannon regarding this, but they could furnish no information in that direction. This name plate evidently, therefore, has been lost during the life of the fan. As far as I can possibly tell by a minute examination and a comparison of the cuts and the exhibit, they both agree in every detail.

Q 7. In Exhibit 51 how are the ends of the fan guard rings fastened together?

A. The fan guard rings are fastened together by an electric butt welding operation.

Q 8. Can you see the butt welds on those rings?

A. Yes.

Q 9. Of what material are the fan blades of Exhibit 51?

A. The fan blades themselves are of steel.

Q 10. What is their finish?

A. The finish is black enamel.

Q. 11. Anything else.

A. The black enamel has been applied directly to the steel.

Q. 12. Of what material are the fan guard rings?

A. The fan guard rings are of steel.

Q. 13. Of what material is the spider of Exhibit 51?

A. The spider is of brass.

Q. 14. Of what material are the rivets?

A. They are of brass.

Q. 15. How many rivets to a spider arm in the blade?

A. Each blade is attached to each spider arm by means of three rivets triangularly located.

Q. 16. Please look now at Plaintiff's Exhibit 66, Peerless 1907 catalogue; Plaintiff's Exhibit 67, Peerless 1908 catalogue; Plaintiff's Exhibit 68, Peerless 1910 catalogue, and the copy of the 1902 catalogue which I happen to have, and state which, if any, of these catalogues show desk fans with spiders of the same general type as that embodied in Plaintiff's Exhibit 51, and which of these catalogues show desk fans with spiders which might have been cut out from a sheet of metal.

By Mr. Church: Objected to as leading.

A. The spiders shown in the 1902 catalogue seem to indicate cast spiders similar to the one used in our Exhibit 51. The Peerless catalogue of 1907 also contains spiders of the same general character as the spider in our Exhibit 51. The Peerless catalogue of 1908 also indicates spiders of the same general character as in the Exhibit

51. In the Peerless Catalogue of 1910 I note a change in the 415 spider. In this case the spider seems to be made of stamped sheet metal. The appearance of the spider in the 1910 catalogue differs materially from the appearance of the spiders in the previous catalogues.

Plaintiff's counsel states that he has in his possession no copies of any other catalogues of either the Warren Electric & Specialty Company or the Peerless Company, or any reproductions of the same.

Direct Examination closed.

No cross-examination.

*Deposition of Richard L. Binder.*

Direct examination.

By Mr. Stackpole:

Q. 1. Please state your name, age, residence and occupation.

A. Richard L. Binder; fifty years old; 931 North Eighth Street, Philadelphia; dealer in special electrical supplies and manufacturer of waste reclaiming equipment. I am president of the K. & B. Company, Philadelphia, manufacturers of baling presses and waste reclaiming equipment and dealers in special electrical supplies.

Q. 2. How long have you been in the business of electrical supplies?

A. Since 1894 or 1895.

Q. 3. During your experience in that business have you handled and sold electric desk fans?

A. Yes, sir.

Q. 4. During what periods?

A. Well, from 1898 to 1902 extensively, and since then as a sort of a side line to our other apparatus.

Q. 5. In 1898 by whom were you employed?

A. From 1898 until 1902 I was employed by Vallee Brothers Electrical Supplies Company, of Philadelphia.

Q. 6. What enables you to fix those dates?

A. In 1898 our plant was burned up, and the proposition was made to me by Vallee that instead of starting in business myself I come and associate myself with them. The proposition was accepted, and I entered into their employ. In 1902 I left them and engaged in business myself, incorporating the K. & B. Company.

416 Q. 7. During your experience in handling and selling electric Desk fans, did you ever handle a so-called Peerless fan?

A. Yes, sir. The Vallee Brothers were the district sales agent for that fan for the Warren Electric & Specialty Company.

Q. 8. And what did you personally have to do with handling and selling these Peerless fans?

A. Well, my position as a salesman was to find a market for some of the fans that Vallee handled; along with the other salesmen I sold them.

Q. 9. Do you recall any so-called cheap Peerless fans?

A. Yes, sir. Somewheres around 1900 or 1901 the Peerless people suggested that they get up a very low priced fan that would be sold as a competing fan on price only, and a conference of the Vallee salesmen was called to consider whether that would be a good move. It was determined to bring out a low priced fan with all of the fine finish taken off of it so as to reduce the cost of manufacture.

Q. 10. Did you handle and sell such low priced Peerless fans?

A. Yes, sir; they were brought out and put on the market.

Q. 11. Would you recognize an example of such Peerless cheap fans?

A. Yes; I am familiar with it and I believe could recognize it.

Q. 12. I show you Plaintiff's Exhibit 51; do you recognize this fan; and, if so, as what?

A. I would recognize that as a Peerless fan, and of that type of cheap fan that I have spoken of.

Q. 13. What are the special characteristics of this fan which enable you to identify it?

A. Well, all of the Peerless fans had the fluted base. That was a sort of a design that they adopted as a mark of their fans at that time. This particular cheap fan was made up with

a rigid frame instead of a swiveling frame or a bracket top frame, and it was made with only one speed; and then, instead of having what was uniformly the polished blades, either brass or nickel finish, they brought them out with the black enameled blades. I have a recollection, too, in connection with that type of fan, that it was suggested and decided that it should not be marked Peerless, because they thought if they did it would kind of count  
417-419 against a better grade of fan that they were also making, and so these fans were put out without name plates on them.

Q. 14. I notice that Exhibit 51 lacks a name plate. Does this accord with your recollection of those fans?

A. Yes; I recollect very well that there was one of the points that was discussed in connection with that low priced fan.

Q. 15. Please examine this Exhibit 51, and in particular the nature of the blades and spiders and rivets, and state whether you recognize these features.

A. Yes, I can recognize those as being the generally adopted construction on the Peerless fan of that date.

Q. 16. Did you ever see a Peerless fan of that date which was different in these respects from Exhibit 51?

A. Never that I noted any different. At that time I can say the universal construction was to make the spider on which the blades were mounted of castings, and that was subject to breakage, a certain chance of breaking the spiders. In later years that was changed to make these spiders of stamped metal.

Q. 17. Does what you have just said apply to the Peerless fans?

A. Peerless fans and other fans also.

Q. 18. Did you ever see any Peerless fans of that period without rivet heads on the blades?

A. I never had any of my attention called to it in any way and have never made any note of it.

Q. 19. I show you a copy of the 1902 catalogue of the Warren Electric & Specialty Company. Do you recognize this catalogue?

A. Yes, sir, I recognize this as one of the types that they distributed to their various agents. We distributed lots of them ourselves. By we I mean Vallee Brothers.

Q. 20. Have you any interest in this controversy?

A. None whatever.

Direct examination closed.

No cross-examination.

PLAINTIFF'S EXHIBIT No. 5. HARMATTA PATENT IN SUIT.

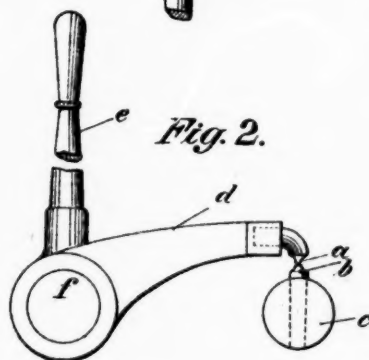
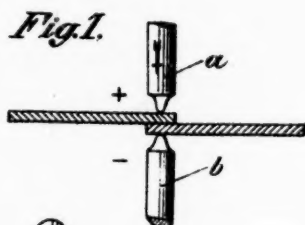
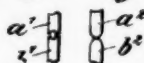
J. HARMATTA.

ELECTRIC WELDING.

APPLICATION FILED DEC. 3, 1908.

1,046,066.

Patented Dec. 3, 1912.

*Fig. 3. Fig. 4.*

*Witnesses:*  
*J. P. Brill*  
*E. C. Duffy*

*Inventor:*  
*Johann Harmatta*  
*E. C. Duffy, atty.*

## UNITED STATES PATENT OFFICE.

JOHANN HARMATTA, OF SZEPESVÁRALJA, AUSTRIA-HUNGARY, ASSIGNOR TO THOMSON ELECTRIC WELDING COMPANY, OF LYNN, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

## ELECTRIC WELDING.

1,046,066.

Specification of Letters Patent.

Patented Dec. 3, 1912.

Application filed December 3, 1903. Serial No. 183,677.

*To all whom it may concern:*

Be it known that I, JOHANN HARMATTA, engineer, a subject of the King of Hungary, residing at Szepesváralja, in the Empire of Austria-Hungary, have invented new and useful improvements in Electric Welding, of which the following is a specification.

My invention relates to the manufacture of metal articles of all kinds and consists in a novel method of fastening the component parts together by the process of electric welding and also in the new article produced thereby.

The invention affords a cheap and practical substitute for riveting and is particularly useful in fastening plates or sheets of metal to one another inasmuch as it may be employed for the thinner sheet metal, such for instance as is used for sheet metal ware like vessels or household utensils.

In general terms the invention may be stated to consist in fastening the pieces together by an electric weld at one or more distinct or well-defined spots, each of small area or extent, in their juxtaposed or opposite plane faces by the application of pressure and heating current localized in such spots, and in the special method of localizing the heating and the pressure in the spot or spots as hereinafter described and specified more particularly in the claims.

It has been before proposed to electrically weld two rods of metal together by a butt-welding process, the area of union effected being substantially coextensive with the cross-section of the pieces at their meeting ends, that is to say, the weld has been made over substantially the whole area of the opposed portions of said pieces. It has also been proposed to make a lap joint between the ends of two strips of metal by electrically uniting them together over substantially the whole area of the lapping surfaces.

A weld formed according to my invention is distinguished however from such prior welds, among other things, by the fact that the opposed surfaces available for uniting the pieces together and in which it might

be possible to form a weld are welded in a small spot or spots only, the spot or spots being surrounded by comparatively large areas of opposed surfaces in which no weld is made.

By the term "electric welding" as used herein I mean that wellknown process in which the work is brought to the welding temperature by internal heat generated by the resistance of the work itself to the passage of an electric current at the place of contact between the parts to be joined by the welding pressure, and I disclaim those processes of fastening pieces of metal together in which the parts are heated and practically melted down by an electric arc generated on the back of the piece by "drawing" an arc by means of the electrode, as well as other processes in which the welding heat is generated externally and electrically in a resistance material and is imparted to the work by heat conduction from said resistance material in contact with the work.

While it is possible, consistently with my invention, to localize the desired pressure and heating current at the desired distinct small spot or area in various ways, this may be accomplished conveniently by pressure applied over the spot and itself localized on the back of the plate or sheet immediately over the small spot in which the union is to be made by using a tool pressed against the work by its end and formed at such end so as to engage the work by a spot or area of small extent and serving, likewise, by preference, as the electrode which feeds the current into the work to heat the same. The member which feeds the electricity being thus at the same time the tool, in this manner the most favorable conditions of working possible are secured, since, as is well known, in really effective welding processes the place of welding brought to the proper temperature must be at once well hammered or pressed in order that the welding may be thorough.

For carrying out the new process various apparatus may be employed, as the necessary pressure may be exerted at the place of welding by the aid of any of those technical means which are suitable for produc-

ing or transmitting pressure, *e. g.*, with a press either direct or by means of indirect transmission by levers. Or it may be by means of simple hand levers, that is to say, by means of direct or indirect manual power, or by other means.

In the accompanying drawings, Figure 1 illustrates the application of my invention to the welding of two plates or sheets overlapped so as to be superposed or have a portion only of their meeting faces presented to one another and by the welding of the opposed surfaces intermittently or at certain spots only through applying pressure at a point or spot on the back of a plate over the spot of desired union. Fig. 2 is a side elevation of a welding device, also illustrated in part in Fig. 1. It shows the construction of the means which may be employed for pressing the electrode against the work by manual power. Figs. 3 and 4 show forms which may be adopted for the ends of the electrodes where they engage the work.

Electrodes *a*, *b* are by preference both formed to engage the work by a small area of contact and may each be adapted to work on the smallest possible surface contact, so as to localize the pressure and the path of the heating current in a very small spot only. The lower electrode *b* may be inserted in a conductor *c* and forms one pole of the heating current, while the upper electrode is carried by an arm *d*, which can be turned on a shaft *f* by means of a hand lever *e*, and is connected with the opposite pole of the circuit feeding current to the work. By this means the electrode *a* may be caused to approach and recede from the electrode *b* and to exert pressure upon the back of the two superposed sheet-metal pieces introduced between the electrodes for the purpose of welding. The two superposed metal plates to be welded together being in position between the electrodes as indicated in Fig. 1, the operation is performed by firmly pressing the electrode *a* down upon the work with any required degree of pressure by means of the lever *e* and the circuit is closed by any suitable means, thus producing a flow of heating current through the work itself substantially localized therein so as to bring the same to the necessary welding temperature at the desired spot only, and the application of pressure by the use of the lever *e* will result in the welding of the plates together in the small sharply defined place of welding at the point or spot desired, which perfectly answers the purpose of a rivet. In this event, especially in the case of thin vessels which are not required to withstand great pressure, the pressure on the place of welding may at the right moment be exactly regulated or kept within the proper limits. Obviously, the operation may be

repeated upon the work at another point if it is desired to join the pieces at a number of spots only.

The time or duration of pressure and heating and the amount of pressure as well as the volume of current for effecting the weld can be readily determined by experiment for different sizes or thicknesses of metal and as well understood in the art of electric welding to which my invention relates.

The operation is completed with the cutting off of the flow of current in the usual manner practiced in the art of electric welding and the withdrawal of pressure when desired to permit the work to be withdrawn from position between the electrodes.

Sheet metal work made by this process is readily distinguished from that made by prior processes by the comparative absence of burning, roughening or disintegration of the material on the back of the plate when the operation is carefully conducted. It further possesses the advantage that there are no rivet heads to mar the finish of the back or outer surfaces of the plate.

I am aware that it has been before proposed to fasten two sheets of metal together by electrically welding them over practically the whole area of their opposed or lapping surfaces. I am also aware of patent to H. F. A. Kleinschmidt No. 616,436, dated December 20th, 1898, and do not wish to be understood as claiming anything disclosed in said patent.

What I claim as my invention is:—

1. The hereinbefore described improved method of fastening two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots.

2. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well-defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected.

3. The herein described method of uniting two pieces of metal, consisting in pressing them together while passing a heating electric current from one to the other and localizing the flow of current and the heating throughout the operation in a spot or spots of circumscribed or limited area as compared with the area of the immediately opposed surfaces so as to limit the union of the pieces to a spot or spots.

4. The improved method of uniting two pieces of metal at a spot or spots only in their opposed meeting surfaces, consisting in pressing the two pieces together, and



passing a welding electric current from one to the other while localizing the pressure in and confining the flow of current to the spot or spots of desired union so as to produce an isolated spot or spots of union, leaving distinct or well-defined areas in which the pieces are not welded together.

5. The method of uniting two sheet metal pieces together face to face, consisting in pressing them together, and, simultaneously with the pressure, passing an electric current from one to the other at isolated or distinct spots in the areas lapping or opposed, said spots being separated from one another by such a distance that there is a union of the sheets at spots entirely surrounded by areas of no union.

6. The method of uniting sheets of metal by pressing them together and at the same time passing a heating and welding current from one to the other at a spot on their meeting surfaces which is restricted in area throughout the operation so as to leave on the meeting surfaces a well-defined and comparatively extensive area of no union completely surrounding said spot.

7. The process of electrically welding thin metallic sheets, which consists in introducing the sheet metal parts to be welded between electrodes, pressing said electrodes firmly together and closing the circuit, whereby a small, sharply defined place of welding which answers the purpose of a rivet is obtained, substantially as set forth.

8. The method of electrically welding two plates or sheets of metal together face to face between electrodes, consisting in restricting the area of contact of an electrode with said plates to a spot, passing a heating electric current from said electrode to the cooperating electrode through said spot to heat the work to welding temperature and applying pressure to the work in line with said spot to effect a welding of one plate to the other.

9. The herein described method of producing a welding temperature in a small distinct spot or point of the opposed surfaces of two plates of metal, consisting in applying pressure at a point or spot only at the back of a plate coinciding with the desired point or spot of welding, while the plates are assembled face to face, to localize the flow of current in the required point or spot in the meeting surfaces and passing an electric current through the plates in the line of the applied pressure to bring the material to welding temperature at the spot of welding by the resistance of the work to the passage of such current.

10. The method of electrically welding a piece of sheet metal at a small distinct spot or point in its plane surface to the face of another piece of metal, consisting in applying pressure at a small point or spot on the

back of the sheet to localize the pressure and electrical heating of the work at a spot of electrical contact in the opposed surfaces of said pieces beneath the point of applied pressure, and passing an electric current from one to the other at the said spot of localized electrical contact to produce a welding temperature at said spot and maintaining the localized pressure to effect a welding at said spot.

11. The herein described method of welding two pieces of sheet metal together by a weld at a small spot only of their opposed surfaces, consisting in applying pressure localized in a spot on the back of a sheet directly over the desired spot of union, while said sheet is assembled face to face with the opposite sheet and so as to localize the pressure and electrical heating in a spot in the meeting surfaces of the sheets, and effecting the weld by passing an electrical current from one sheet to the other through said spot in the line of the localized applied pressure, and by pressure applied in said line.

12. The method of electrically welding two pieces of sheet metal to one another, consisting in pressing the sheets together by pressure applied and localized in a distinct well-defined point or spot on the rear surface of a sheet while passing an electric current through them in the line of the pressure, thereby localizing the path of the heating current from one to the other of the meeting surfaces of the sheets to cause the said sheets to be heated to welding temperature by the electric resistance of the work at said spot, and applying pressure localized over said spot whereby the pieces are welded together at a distinct well defined spot in their meeting surfaces answering the purpose of a rivet.

13. The method of electrically welding two plates of metal together face to face, consisting in pressing the plates together between two electrodes one of which at least makes contact with the rear of a plate at a spot only, feeding a heating electric current into the plates by said electrodes to bring the plates to welding temperature by the heating effect due to the electrical resistance of the portion of the circuit containing said plates, and effecting an electric welding of one plate to the other at a spot beneath the electrode by the pressure of said electrode.

14. The herein described method of fastening two sheets of metal together at a distinct point or spot only in their plane meeting surfaces, consisting in pressing the sheets together and localizing the contact pressure of each upon the other at the said distinct spot or point, passing an electric current from one sheet to the other through said localized spot of contact pressure between them to bring the metal to welding



temperature in said spot and thereupon completing the weld in the material so brought to welding temperature and uniting the pieces by a welded union at said spot only.

15. The herein described method of fastening two pieces or sheets of metal together at a spot only in their meeting surfaces, consisting in pressing them together at said spot, passing an electric current through said pieces or sheets at said spot to raise the same to welding temperature and applying welding pressure localized in the back of a sheet immediately over said spot to effect the weld.

16. The herein described method of welding two pieces of sheet metal together by pressing them together between electrodes engaging the surface of the sheets at a spot only and bringing the section of work between them to the welding temperature by its resistance to the passage of an electric current fed through the work by said electrodes.

17. Metal plates fastened together by a number of distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic condition and the spots on the meeting surfaces being separated from one another by distinct unwelded areas.

18. Sheet metal work comprising pieces of sheet metal welded together in the material of their meeting surfaces and in spots only, each surrounded by distinct areas of

unwelded union, the back surfaces of said pieces being substantially unaltered over the welded spots, substantially as and for the purpose described.

19. Composite metal work having its component pieces welded together in spots only involving the material of their opposed or meeting surfaces, said spots being each entirely surrounded by distinct areas of unwelded union and the portion of the pieces back of the welds being substantially unaltered, as and for the purpose described.

20. Metal work comprising a metal plate fastened on its surface to the opposed surface of another piece of metal by a weld at a spot only in the material of the opposed surfaces, said spot being surrounded by a distinct area of unwelded union and the back surface of said plate being practically unaltered over said spot, as and for the purpose described.

21. A metal article comprising two bodies of metal having adjacent plane surfaces united at a plurality of spaced and isolated spots of integral and autogenous welded union, the metal at the spots of welded union having substantially the same qualities as at other points.

In witness whereof I have hereunto signed my name this 5th day of November, 1903, in the presence of two subscribing witnesses.

JOHANN HARMATTA.

Witnesses:

CARL BECKER,  
T. LA GUARDIA

S. Z. DE FERRANTI.

PROCESS FOR ATTACHING TURBINE BLADES TO THEIR CARRYING ELEMENTS.

APPLICATION FILED DEC. 15, 1905.

906,400.

Patented Dec. 8, 1908.

3 SHEETS—SHEET 1.

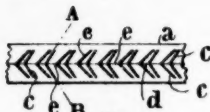


Fig. 1.



Fig. 3.

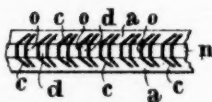


Fig. 5.

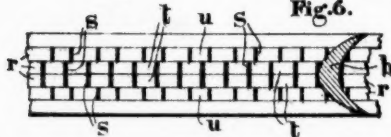


Fig. 7.



Fig. 8.



Fig. 17.



Fig. 2.



Fig. 4.



Fig. 9.



Fig. 10.



Fig. 12.

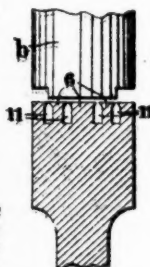


Fig. 13.

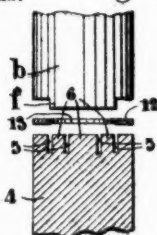


Fig. 16.

Attest:

Edw. A. Folsom  
Edward N. Barton

Inventor,

Sebastien Ziani de Ferranti,  
By *John W. Muddleton, Danielson & Co.*  
Attys.

S. Z. DE FERRANTI.

429

PROCESS FOR ATTACHING TURBINE BLADES TO THEIR CARRYING ELEMENTS.

APPLICATION FILED DEC. 15, 1905.

906,400.

Patented Dec. 8, 1908

3 SHEETS—SHEET 2.

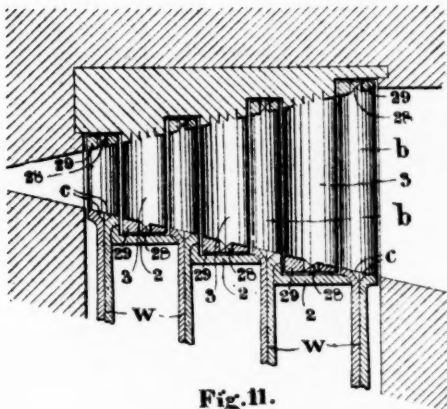


Fig. 11.

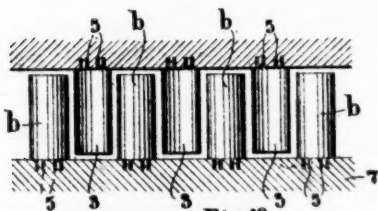


Fig. 13.

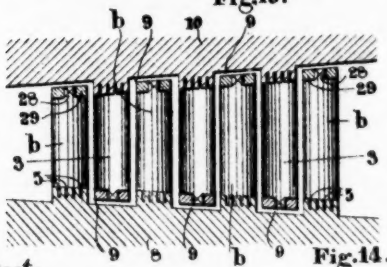


Fig. 14.

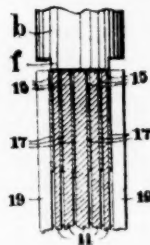


Fig. 16.

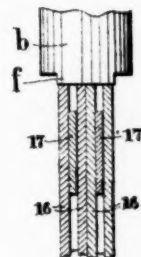


Fig. 19.

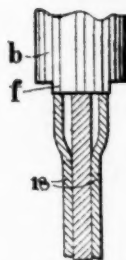


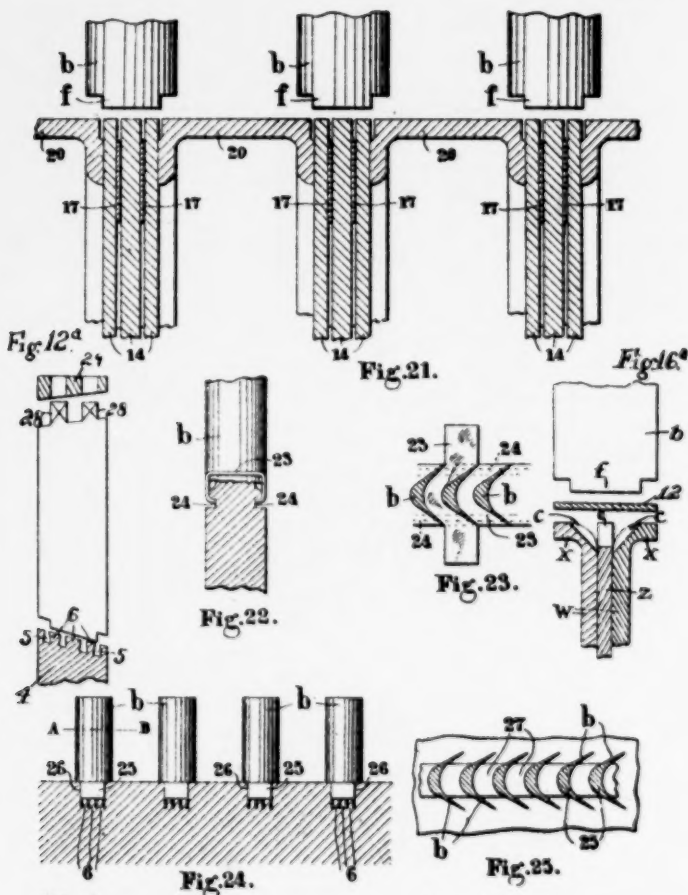
Fig. 20.

Attest:

*Edw. L. Tolson*  
*Edward N. Sartor*

Inventor,

*Sebastian Zani de Ferranti*  
 By *Spencer, Macdonald, & Macdonald*  
 Attys



Attest:

*Edward L. Tolson*  
*Edward N. Sinton*

Inventor,

*Sebastian Jani de Ferranti*  
 By *Spier, Middleton, Deussen & Co.*  
 Attys.

## UNITED STATES PATENT OFFICE.

SEBASTIAN ZIANI DE FERRANTI, OF HAMPESTEAD, LONDON, ENGLAND.

## PROCESS FOR ATTACHING TURBINE-BLADES TO THEIR CARRYING ELEMENTS.

No. 908,400.

Specification of Letters Patent.

Patented Dec. 8, 1908.

Application filed December 13, 1905. Serial No. 291,933.

*To all whom it may concern:*

Be it known that I, SEBASTIAN ZIANI DE FERRANTI, a subject of the King of Great Britain and Ireland, and residing at 31 Lyndhurst road, Hampstead, London, N. W., England, have invented certain new and useful Improvements in Processes for Attaching Turbine-Blades to Their Carrying Elements, of which the following is a specification.

This invention relates to the welding of turbine blades on to the wheels, rings or drums carrying them and also to apparatus used in connection therewith.

The object of my present invention is to improve upon processes at present employed or electrically welding turbine blades to their carrying elements so as to obtain with greater certainty a stronger weld and therefore a better attachment of the blade.

A further object of my invention is to effect the weld with less disturbance of the neighboring metal so as to obtain a smooth passage through the blades.

It has heretofore been proposed to make the disk, ring or drum at the point at which each blade is welded of approximately the same section and conductivity as the blade itself. According to one method which has been proposed a wheel of rather less thickness at the rim than at the width of the blades is taken and grooves cut across the rim thus leaving teeth of the necessary section projecting therefrom on to which the blades were welded. This construction left the projecting tooth on to which the blade was welded of a different cross section from that of the blade itself, the metal in the neighborhood of the root of the welded blade being consequently rough and irregular and offering considerable frictional resistance to the passage of the working fluid. According to another method the blades are welded on to circumferentially formed rings in the rim of the wheel or other part on to which the welding was to be done; the passage between the blades in the neighborhood of the weld was however even more irregular according to this method than according to that described above.

Now the present invention consists in so forming the ends of the blades and the parts upon which they are welded that a smooth path of any desired form is made and that a weld of great strength not only in resisting

centrifugal force but also tangential force is produced.

Referring now to the accompanying drawings which form part of the specification:—

Figure 1 shows a developed edge view of part of a wheel built up of two disks, each provided with angled slits, Fig. 2 being a corresponding section taken on the line A B of Fig. 1, and Fig. 3 a part elevation looking on one of the adjacent faces of a disk; Fig. 4 shows an elevation of a turbine blade having a welding shank or tag; Figs. 5 and 6 correspond respectively to Figs. 1 and 2, the wheel however being built up of three disks instead of two; Fig. 7 is a developed edge view of part of a wheel built up of several disks of equal thickness assembled stepwise as regards the welding teeth. Fig. 8 being similar generally but showing a wheel built up of disks of different thickness; Fig. 9 shows a section through the rim portion of a wheel built up of two flanged disks, Fig. 10 being a similar view of a modified form in which a center disk is added to the above; Fig. 11 shows a multiple wheel built up of component wheels of the type shown in Fig. 9; Fig. 12 illustrates a method of welding in which circumferential grooves are cut in a wheel, while Fig. 12<sup>a</sup> shows a modification of the wheel shown in Fig. 12 but with V-shaped grooves. Figs. 13 and 14 show the same plan adapted to multistage turbines having cylindrical and conical drums respectively; Fig. 15 shows a wheel in which the circumferential rings are burred or rolled over; Figs. 16 and 17 illustrate a method of welding in which a punched strip is interposed between the turbine wheel and blade; Fig. 16<sup>a</sup> shows a modification of the method illustrated in Figs. 16 and 17, and in which an unperforated strip is interposed between the wheel and the blade. Figs. 18, 19 and 20 show wheels built up of disk portions of graded thickness and spaced at the edges so as to form circumferential grooves; Fig. 21 shows a drum built up of individual wheels having circumferential grooves; Fig. 22 shows a section through the rim portion of a turbine wheel in which strips are inserted between adjacent blades, Fig. 23 being a corresponding edge view showing a strip before bending over; Fig. 24 shows a form in which the welding takes place at the bottom of a comparatively deep groove, packing pieces being calked into this groove between adja-

cent blades, Fig. 25 is a corresponding part section taken on the line A B of Fig. 24.

I wish it to be understood that in order to avoid undue complexity in the drawings, they are to a large extent of a diagrammatic nature.

Where desirable the same reference symbols are used to denote corresponding parts in the different figures.

According to one method of carrying the invention into effect, (see Figs. 1 to 3) I make the wheel of two disks, *a*, *a*, of slightly more combined width at their rims than the width of the blades, *b*.

Across one circumferential corner or edge of each wheel disk, *a*, I cut grooves or slits, *c*, by means of a fine circular saw or other convenient means, the plane of each cut, (i.e., the plane of the saw, if a saw is used) being inclined at an angle of 45° or thereabouts to the center plane of its wheel disk and intersecting this latter plane in a radial line. Consecutive cuts are put at an angle to each other as shown so that when the two wheel disks, *a*, which are cut right and left hand, are put together, the cuts mark off on the edges of the disks a series of parts, *d*, which approximate in shape to that portion of the root of the blade to be welded to them. The metal, *e*, of the wheel rim is not cut away between these parts, *d*, but is left standing, the rim thus consisting of partially cut "teeth", *d* and *e*, alternately disposed, the blades being welded to those marked *d*, while those marked *e* are left blank.

The blade ends I form by punching or other suitable means with a shank, *f*, (see Fig. 4) which may stand out from the body of the blade say one twentieth of an inch.

The blades when being welded are held in closely fitting jaws shaped to clear adjacent blades the blade being placed in the jaws so that only the shank, *f*, projects.

In cutting the tooth on to which, the welding takes place and in proportioning the end of the blade and the conductivity of the jaws which hold it, I am careful to arrange the various sections, sizes, and conductivities so that the tooth on to which welding is to take place is at first heated more rapidly than the shank of the blade. The effect of this and the above described arrangement is that the principal heating first takes place between the blade and the tooth, *i*, *e.*, on the surface of the part on to which welding is to be effected. A very considerable pressure is applied during the process, and this results, when the above arrangement is carried out, in the actual welding surface being forced into the wheel or other part and the surface of the wheel being left clean and smooth and untouched by the disturbing bur which takes place at the weld. Moreover, the forcing into the wheel of the blade shank spreads the metal

under the heat of welding and largely fills up the saw cuts in the rim. This has the effect of allowing a good weld to be made with a fair amount of metal crushed out, which is a very desirable feature. It also makes the welded end of the blade fit the side of the grooves into which it is forced and so greatly supports the blade against side strain. So fully is this carried out in practice when the blade welding is done according to my present invention, that it is possible to hammer over the blades at right angles to their original position without cracking the metal of the weld, thus showing that great strength and rigidity are obtained according to the method of my present invention.

The arrangement above described as typical of my invention may be varied in many ways. Thus according to a modification, the wheel instead of being built up of two disks, *a*, as shown in Fig. 1, may be formed of three disks, (see Figs. 5 and 6)—a center one, *n*, which has slits, *o*, cut straight across the edge from face to face instead of at an angle and two side disks, *a*, disposed one on each side of the center one, *n*, to make up the thickness of the finished wheel as desired, the side disks being right and left hand and having grooves or slits, *c*, cut in them at an angle, as already described. The section, *d*, of the face of each "tooth" on to which the welding is to be effected approaches even more closely to the section of the blade according to this method than in the arrangement above described. The complete wheel may thus by an obvious extension of the method of the preceding paragraph be made up of any number of separate disks that is found convenient, provided that the above described methods are adhered to of separating those portions on to which the welding is to take place.

According to another method, when the wheel is built up of several disks instead of cutting some or all of the slits at an angle, each disk is provided with slits, such as those shown at *o*, Figs. 5 and 6, cut straight across the edge but in this case the width of the "teeth" on to which welding is to take place must be graded and stepped round so as to approximate as closely as possible to the section of the blade. Thus referring to Fig. 7, a wheel is indicated as built up of six disks, *r*, of equal thickness, the combined thickness of the central four being equal to the width of the blade shank. Cross slits, *s*, are cut as indicated so as to leave broad welding teeth, *t*, on the two central disks and narrower teeth, *u*, on the second and fifth disks. By assembling the disks in a stepped manner as shown, the welding surfaces can be arranged to follow closely the section of the blade. According to a modification of this method, (see Fig. 8) the disks, *v*, to which the blades are welded may conveniently be made of dif-

ferent thicknesses and assembled in a symmetrical manner with the thickest in the middle, the thicknesses of succeeding plates decreasing towards the sides. The disks are provided with cross slits, *a*, as before so as to leave welding teeth, *t*, of different widths. By thus combining disks of different thicknesses with welding teeth of different breadths arranged in a stepped manner, it is easy with straight cross grooving to provide an isolated welding surface which approximates very closely to the shape desired.

According to another modification of the above described methods, where I desire to weld on to a smooth face of either cylindrical or conical section and where owing to the moderate speed of the turbine the disks can be made of thin metal, I form the wheel, (see Fig. 9) of say two disks, *w*, which are dished at the rims so as to provide flanges, *x*, or in other words, they are turned over from the form of a disk into the form of a cylinder at the rims. Two disks thus formed are put together as shown in Fig. 9 with the disk parts touching and cylindrical parts, *i. e.*, the flanges, *x*, projecting outwards. The surface thus presented is grooved from the center dividing line outwards towards the edges of the cylindrical portion, the grooves or slits, *c*, being cut at an angle so as to isolate portions of the faces where the welding is to be done in a manner precisely similar to that already described above with reference to Figs. 1 to 3. This method, for example, may be carried out to effect with two disks each of say one tenth of an inch in thickness and turned over sufficiently round the periphery to present a surface half an inch in width to correspond to the width of the blades.

The method just described may itself be modified by making the wheel of three thin disks, namely a central one, *Z*, and two side ones bent over as above described, (see Fig. 10), the center one being provided with slits, *c*, cut straight across the edge as in the form described with reference to Figs. 5 and 6, and the side disks being cut at an angle through a circumferential corner as before. The welding then takes place across the edges of all three disks.

When multiple wheels of this description are built to go on a shaft, the spaces in between the rims (see Fig. 11) may be filled up with circumferential rings, 2, of channel section or the like into which the shrouded ends of the standing blades, 3, project thus forming an effective guard and preventing undue friction with the working fluid. The shrouding ring of the running and the standing blades may be attached by any of the well known methods.

According to another method I weld the blades upon wheels, rings, or drums, the welding surface of which is cut up into rings by means of circumferential grooves of the

desired width and spacing run round about them: but, unlike the arrangement of my previous invention, I leave a smooth face with comparatively narrow grooves cut in them, and I also grade the width of the circumferential rings which are left between the grooves in such a way that the surface presented under each part of the blade is approximately of the same width as the surface at right angles of the blades, *i. e.*, the thickness of the blades, at each part. Moreover, I form the blade with a projecting shank as already described herein, and carry it in jaws as already described. Welding may then be most satisfactorily effected between the blade shank and the ring surface, the shank of the blade being forced into this and a smooth path being left between the blades, any little disturbance on the surface, due to the weld, being flattened by the jaws, which are flush with the end of the blade proper and which come in contact with the surface on to which the welding is done, but only after the current has been automatically cut off. Thus referring to Fig. 12, the rim portion of a wheel, 4, is shown having circumferential grooves or slits, 5, separating continuous rings of metal, 6, of graded thicknesses as explained above. A blade, *b* having a welding shank, *f*, is shown in the figure in a position, closely adjoining the prepared wheel rim, a shrouding ring, 29, being attached by any known method. The welding may be effected on to any number of the circumferential rings, 6, and these may have any desired graded widths to suit the particular case in point as explained above. It is convenient to cut four circumferential slits, 5, thus leaving three rings, 6, on to which to weld, a central wide one and a narrower one on each side, the exterior rings against which the cut ends of the blade butt when pressed home not being used for welding.

Referring to Fig. 13, the circumferential groove method is shown applied to both the running blades, *b*, and the standing blades, 3, of a multistage turbine having a cylindrical drum, 7, while in Fig. 14, a conical drum, 8, is shown all the blades being provided with shrouding rings; in this latter case, however, I prefer to cut grooves or recesses, 9, into which the shrouding rings on the standing and the running blades may enter both in the conical drum, 8, and in the casing, 10, respectively.

Where I desire to get a still smoother face, *i. e.*, rim surface, than is obtained with the plain circumferential grooving on to which the tag or shank of the blade is welded, I may, after providing the wheel or the like with grooves, 11, as before (see Fig. 15), roll its surface, *i. e.*, the surface of the rings, 6, formed on the wheel, so as to close the grooves over, although the inner part of the slot remains and so insulates the heat that



welding takes place satisfactorily as already explained. In order to facilitate the burring over of the surface of the rings, 6, I may make the grooves of V section Fig. 12<sup>a</sup> instead of the section shown in Fig. 12. When the burring roller is then applied, the metal spreads out more readily so as to close over the grooves; after the rolling, the wheel may have its surface machined or ground so, as to finish it.

According to another method I obtain a smoother passage between the root portions of the blades by means of covering the ringed surface or edge of a wheel prepared as shown in Fig. 12 with a thin strip of metal, 12, continuous or in sections (see Figs. 16 and 17) out of which holes, 13, are punched of a similar shape to but larger than the cross section of the tag or shank of the blade. The tags, 14, are then put through the punched holes, 13, in the strip direct on to the circumferential rings, 6, for welding. The tag is made rather longer according to this process and the edges of the blades coming down on to the side portions of the strip hold it in position apart from any attachment which is obtained by the fusing together of the parts in welding.

According to another method Fig. 16<sup>a</sup>, I may cover the circumferential grooves with a very thin strip of metal, such as that numbered 12 in Fig. 16, but without holes punched in it; the welding is then effected just in the same way as though the strip was not present. Special care must be taken when working according to this method as regards the proportioning of the opposing sections and the adjusting of the welding current so that the parts may be satisfactorily welded together.

According to a modification of the circumferential grooving method, I may form the wheels of disks, 14, put side by side (see Fig. 18) with spaces 15, in between them which correspond to the grooves or slits, 5, already described above. The thickness of metal between the spaces, 15, are so proportioned that their section is suitable for welding in relation to the section of the blade at the particular part concerned. I may accomplish this either by adopting individual disks of different thicknesses as shown in Fig. 18 or I may use disks, 16, of the same thickness as shown in Fig. 19, and group them together so as to give the effect desired.

The individual disks may either be assembled with intervening packing rings or distance pieces, 17, as shown in Figs. 18 and 19 or the outer disks, 18, may be dished as in Fig. 20. I form the blades with shanks and hold them in jaws as already described, the welding then being effected in a most satisfactory manner. Additional disks, 19, as shown in Fig. 18, may be put on each side of the wheel in the first instance or after-

wards; these disks are of the same diameter as those on which the blade shank is actually welded but owing to this projecting shank and the cutting away of the other part of the blade end, welding does not take place on to these additional disks and they merely act as shrouds. Or according to a modified arrangement as shown in Fig. 21, I may fasten rings, 20, in between the peripheries of the circumferentially grooved wheels in such a manner that a smooth or grooved path is formed circumferentially in between the blade ends thus giving the structure the external appearance of a drum. I may so form and assemble the component parts of the complete drum according to this modification that the welding takes place on a conical surface as in Fig. 11, the path through the blades taken by the working fluid then expanding in area so as to allow for the change in velocity of the fluid as it does work.

I deal with any irregular surface that may be left after welding by means of stamping, 23, (see Figs. 22 and 23) which are put in between each pair of adjacent blades; the ends of these stampings are turned over and pressed into grooves, 24, cut round each side of the wheel rim as shown. It will be evident that according to this method the path traversed by the working fluid between the blades may either remain constant in area as in Fig. 13 or expand as in Fig. 14.

According to another method, (see Figs. 24 and 25), I may form the blades with long shanks, 25, say  $\frac{1}{4}$  inch or thereabouts and weld these shanks on to circumferential rings, 6, formed at the bottom of grooves, 26, running round the drum or the like in positions corresponding to the rings of blades to be welded. In this case the welding jaws not only entirely contain the blades but also about  $\frac{3}{16}$  inch of the blade shank. Welding is then effected as already described on to the projecting rings, 6, within the main groove, 26, the edges of the blades left from the cutting of the shank coming down into contact with the surface of the wheel or drum on to which the welding is done. After the welding is complete, packing pieces, 27, formed to the shape of the blades on two sides and to the width of the main groove, 26, on the other two sides are pressed in between the blades into the main groove and are then held in position by means of calking, the calked packing piece adding to the tangential stiffness and the weld at the bottom of the groove absolutely insuring the holding of the blade in position.

All the blades already described may have their ends cut either square or oblique to their length and where the blades are short, as for certain purposes, the smooth ends, i. e., the ends remote from the blade carrier,



may be left unsupported, this method of construction being satisfactory owing to the great strength of fixing afforded by all the methods described according to this invention.

I wish it to be understood that the examples of welded blade carrying members hereinbefore described are to be regarded as illustrative of my invention and not in any way limiting the scope thereof as it is evident that other modifications will readily suggest themselves to persons in the art.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A process for welding turbine blades to their carriers consisting in adjusting the relative heat capacities of the parts to be welded so that the welding part of the carrier is heated more quickly than that of the blade, and forcing the weld formed between said parts underneath the surface of said carrying member.

2. A process for welding turbine blades to their carriers consisting in partially isolating the welding parts of the carrier from the main portion thereof and forcing the weld formed between the blade and such isolated parts underneath the surface of said parts, as set forth.

3. A process for welding turbine blades to their carriers consisting in partially isolating the welding parts of the carrier from the main portion thereof by circumferential grooves and forcing the weld formed between the blade and said isolated parts underneath the surface of said parts, as set forth.

4. A process for welding turbine blades to their carriers consisting in partially isolating the welding parts of the carrier from the main portion thereof by transverse slits, the sur-

face so isolated approximating in section to that of the blades to be attached thereto and forcing the weld formed between the blade and said isolated parts underneath the surface of said parts, as set forth.

5. A process for welding turbine blades to their carriers consisting in partially isolating the welding parts of the carrier from the main portion thereof and forcing the weld formed between the blade and the said isolated parts underneath the surface of said parts so that the metal crushed out during welding is incorporated with the parts of the carrier contiguous to said welding parts, as set forth.

6. A process for welding turbine blades to their carriers consisting in partially isolating the welding parts of the carrier from the main portion thereof by cutting transverse slits in the disk members forming said carrier the said isolated parts approximating in cross section to that of the blades to be attached to said carrier and forcing the weld formed between the blade and said isolated welding parts underneath the surface of said welding parts.

7. A process for welding turbine blades to their carriers consisting in partially isolating the welding parts of the carrier by spacing the disk members forming said carrier and forcing the weld formed between the blade and said carrier, underneath the surface of said carrier.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SEBASTIAN ZIANI DE FERRANTI.

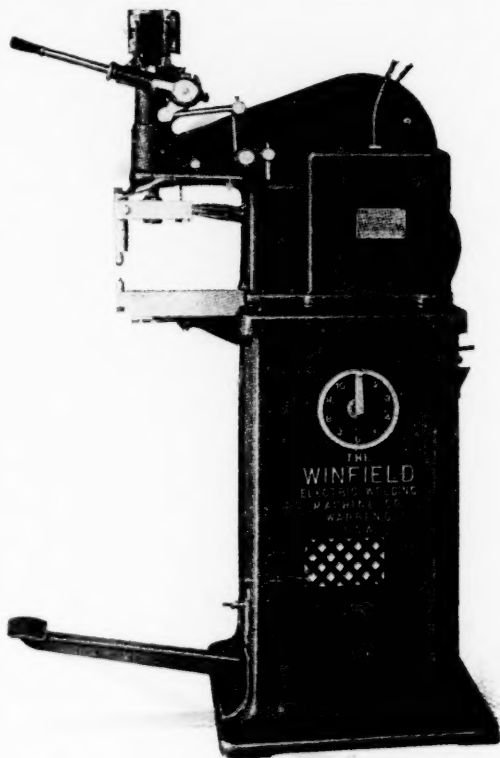
Witnesses:

ALBERT E. BARKER,

BERTRAM H. MATTHEWS.



## PLAINTIFF'S EXHIBIT No. 1.





*Exhibits.*

**PLAINTIFF'S EXHIBIT No. 6.—TITLE PAPER OF HARMATTA  
PATENT IN SUIT, H. F. L., N. P. & Sp. Ex.**

**MEMORANDUM OF AGREEMENT BETWEEN THOMSON ELECTRIC WELD-  
ING COMPANY AND UNIVERSAL ELECTRIC WELDING COMPANY.**

June 17th, 1909.

It is agreed that the interference which has been declared in the United States Patent Office between the application of Adolph F. Rietzel, Serial Number 247,081, owned by the Thomson Electric Welding Company, and the application of Lawrence S. Lachman, Serial Number 233,109, owned by the Universal Electric Welding Company, shall be dissolved by the withdrawal of the claims in interference of the said application of Lachman or a concession of priority by Lachman or such other arrangement as counsel shall deem best and that a patent may issue forthwith on the application of Rietzel. The above agreement is made because of the conviction of the parties that said Rietzel and not said Lachman is entitled to said patent.

Upon the issue of such patent to Rietzel, the parties will enter into a contract in the form hereto annexed marked "Exhibit 1".

THOMSON ELECTRIC WELDING COMPANY [SEAL]

By B. F. Spinney, Pres't.

Attest: W. H. Hodges, Secy. & Treas.

UNIVERSAL ELECTRIC WELDING COMPANY [SEAL]

By M. Lachman, President.

Attest: Reginald Hawley.

"EXHIBIT 1".

This agreement made this 20th day of July, 1909, by and between the Thomson Electric Welding Company of Lynn, a Massachusetts corporation, party of the first part, and the Universal Electric Welding Company of New York City, a corporation duly organized under the laws of the State of New York (formerly the Standard Pulley Manufacturing Company) party of the second part: Witnesseth:

That whereas the parties hereto entered into an agreement on the 26th day of February, 1909, a copy whereof is hereto annexed marked "A", and whereas the parties desire to amend said agreement ;

Now, therefore, in consideration of one dollar by each party to the other paid, the receipt whereof is hereby acknowledged, and of the mutual covenants herein contained, it is agreed as follows, to wit :

In case of the termination of said agreement of February 26, 1909, by default of the party of the second part, that is to say, by reason of the neglect or refusal of the party of the second part to perform and observe any or all of the agreements, terms and conditions in said agreement contained, the party of the first part, in addition to all the rights accruing to it by said agreement and in particular by clauses 16 and 17 thereof, shall have the further right to collect from any and all sub-lessees of the party of the second part all royalties due from said sub-lessees to the party of the second part from and after the time when said agreement is terminated as aforesaid, as and when the same shall become due under the several agreements of the party of the second part with said sub-lessees. The party of the second part hereby irrevocably constitutes and appoints the party of the first part its attorney in its name and stead to collect all said royalties thereafter becoming due from any and all sub-lessees, and covenants and agrees that it itself will not interfere in any way with the collection of such royalties, and hereby authorizes and empowers the party of the first part to sue for and collect the same, using the name of the party of the second part, if necessary therefor. Out of all royalties so collected from its sub-lessees by the party of the first part, it, the party of the first part, shall retain for its own use so much thereof as is required to pay to it all sums due it from said party of the second part under said contract of February 26, 1909, together with the expense, if any, of collecting the same, and the party of the first part shall pay over the balance so collected to the party of the second part, its successors, assigns or legal representatives.

It is further agreed that the machines which are the subject matter of said contract of February 26, 1909, shall each bear upon the name plate thereof the inscription "Property of the Thomson Elec-

tric Welding Company, leased by the Universal Electric Welding Company".

The party of the second part covenants to vigorously push the business of leasing machines made under the patents of the parties hereto as provided in said agreement of February 26, 1909, and to devote its best efforts to developing and increasing said business.

The party of the second part further agrees that in each and every case in which it shall sub-let a machine owned by the party of the first part to a sub-lessee, it will make with such sub-lessee a contract of the form hereto annexed marked "B", and that it will in no case agree to accept from any sub-lessee a less royalty for a machine than that which the party of the second part is to pay to the party of the first part on said machines.

The party of the first part further agrees that the party of the second part may state in its leases to its sub-lessees that it, the party of the second part, "controls" United States Letters Patent No. 928,701 to the Thomson Electric Welding Company, assignee of Adolph F. Rietzel.

Said agreement of February 26, 1909, except as hereby amended, shall remain in full force and effect.

The provisions of this agreement shall be binding upon and inure to the benefit of the parties, their successors and assigns.

In Witness Whereof the Thomson Electric Welding Company has caused its name to be signed and its corporate seal to be hereto affixed by B. F. Spinney, its president, thereunto duly authorized; and the Universal Electric Welding Company has caused its name to be signed and its corporate seal to be hereto affixed by M. Lachman, its president thereunto duly authorized.

THOMSON ELECTRIC WELDING COMPANY,

[Seal]

B. F. Spinney, President.

Attest: W. H. Hodges.

UNIVERSAL ELECTRIC WELDING COMPANY,

[Seal]

M. Lachman, President.

Attest: Reginald Hawley.

Exhibit A.

This agreement made this twenty-sixth (26th) day of February 1909, by and between the Thomson Electric Welding Company of

Lynn, Massachusetts, a Massachusetts corporation, party of the first part, and the Universal Electric Welding Company, of New York, New York, a New York State corporation (formerly the Standard Pulley Manufacturing Company), party of the second part witnesseth:

Whereas, The parties to this agreement severally own or control United States patents relating either to that branch of the art, or to machines and devices used in that branch of the art of electric welding, known as point or spot welding, and own or have the right to use sundry other inventions relating to said point or spot welding or to machines and devices used in connection therewith, some of which inventions form the subject of applications for Letters Patent of the United States already filed; and the parties hereto severally propose to apply for and secure Letters Patent of the United States on other similar inventions relating to said point or spot welding and to machines and devices used therein; and

Whereas, The parties to this agreement desire to combine their interests under said patents, inventions, applications, machines and devices, and to continue this contract as long as there are any patents or inventions of either party, relating to the art of point or spot welding or to machines and devices for use in connection therewith, and thereafter as long as the second party is able to continue to grant licenses to use the art and to sub-lease or make any other equally profitable disposition of machines and devices for point or spot welding; and

Whereas, the first party has heretofore leased certain electric welding machines, apparatus and appurtenances to the second party, and certain contracts and agreements relating to said point or spot welding were heretofore on November 15, 1904; March 15, 1905; November 3, 1905; November 27, 1905; January 1, 1906; November 13, 1906; and December 1, 1906, duly made and entered into between the said Thomson Electric Welding Company and the Standard Pulley Manufacturing Company (now the Universal Electric Welding Company); and

Whereas, the parties to this agreement are desirous of abrogating each and all of said agreements (except in so far as is provided by Clause 21), and in lieu thereof, desire to adopt a new agreement which shall consolidate and embody the substantial features of said



prior agreements, or some of them, in so far as the same are now in full force and effect.

Now therefore, in consideration of the mutual covenants and agreements herein contained, the parties to this agreement do hereby covenant and agree as follows:

1. All electric welding machines, apparatus and appurtenances heretofore leased by the first party to the second party shall continue to be leased by the second party from the first party. The word "machines" hereinafter used, is intended to mean "electric welding machines, apparatus and appurtenances".

2. The second party shall pay the first party a continuing annual rental, payable in quarterly instalments in January, April, July and October, of each and every year during the continuance of this lease, in the following amounts, to wit:

On each hand welding machine heretofore installed or to be hereafter installed, one hundred dollars (\$100).

On each semi-automatic welding machine run by belt, heretofore installed or to be hereafter installed, one hundred twenty-five dollars (\$125).

On each full automatic feeding and ejecting welding machine heretofore installed or to be hereafter installed, one hundred fifty dollars (\$150).

3. The first party shall promptly furnish the second party with any and all point or spot machines which may be required by the second party, from time to time, and shall charge a reasonable price therefor; payment to be made promptly upon installation and acceptance.

4. The second party shall, during the continuance of this contract, obtain exclusively from the first party all machines, unless the first party in writing gives permission to the second party to build any special machines.

5. All machines used by the second party, pursuant to the terms and conditions of this agreement, whether said machines be obtained by the second party from the first party, or whether they be built by the second party, shall severally be subject to the payment by the second party to the first party, of the annual royalties hereinabove provided for.

6. All machines heretofore installed or that may hereafter be

installed by the first party for the benefit of the second party, may be sub-leased and let by the second party to any person, firm or corporation in any locality in the United States; but said machines shall, nevertheless, be subject to all the conditions and covenants of this lease when sub-leased and let, the same as if they were used by the second party.

7. In case any of said machines shall be sub-leased by the second party, said sub-letting shall be at all times subject to the condition that such sub-lessee shall not add to or subtract from said machines any mechanism whatsoever; nor shall said sub-lessee make or allow to be made any change or alteration in the same without the consent thereto in writing of the first party.

8. The first party further covenants and agrees with the second party that in those cases where the second party has sub-leased to third parties any machines under the terms and conditions of this agreement, and such machines have been surrendered to the second party by said sub-lessees, and are no longer in use either by the second party or by its sub-lessees, thereupon and so long as said machines are so held by the second party and shall not be in use, the second party shall not be liable to the first party for the payment of any royalty thereon under the terms and conditions of this agreement.

9. Any machines required by the second party for butt or end-to-end welding, shall, when installed, be subject to all the conditions of this agreement, the same as if they were for point or spot welding.

10. The second party shall notify the first party promptly in writing upon the installation of a machine, of its location and the name of the person, firm or corporation to whom sub-leased, and also promptly notify the first party in writing of any change in location of sub-lessee.

11. All machines heretofore leased, as well as all subsequent machines leased under the conditions of this agreement, shall be entered by number, type and description, in the Schedule hereto annexed and made a part of this agreement.

12. The first party hereby grants to the second party the exclusive right to use for point or spot welding within the United States during the life of this agreement, any and all inventions and pat-

ents relating to the art of point or spot welding, now or hereafter owned or controlled by the first party, and also the exclusive right to use any and all machines for point or spot welding built by it or with its permission. Nothing in this is intended to restrict the first party in butt or end-to-end welding.

13. The first party hereby grants unto the second party the right to use at any time and in any place in the United States, in connection with the operation of said machines, any invention or process capable of use in connection with the art of Point or Spot welding, now or hereafter owned or controlled by the first party.

14. The first party further covenants and agrees that it will without expense to the second party, in all reasonable ways as occasion may offer, assist the second party in the obtaining of contracts for electrical Spot or Point welding.

15. The parties to this agreement hereby covenant and agree by and with each other that they will never at any time during the term of any Letters Patent issued to either of said parties, relating to the art of electric welding or to machines to be used in connection therewith, contest or question the validity of the same, or the sufficiency of either the specifications or the title of the owner thereof.

16. It is further covenanted and agreed that in case the second party neglects or refuses to perform and observe any or all of the agreements, terms and conditions herein contained, the first party shall have the right to terminate this agreement by giving to the second party six (6) months' notice in writing of its election so to do; and if the second party then fails to repair and make good such default or defaults on account of which the notice is given, on or before the expiration of said six months, this agreement and all rights of the second party hereunder shall be wholly at an end, and the first party shall be forthwith released from all its obligations thereunder. But the second party shall not thereby be released from liability to pay the annual rentals on machines, at the rate hereinbefore set forth, already accrued at the termination of said agreement.

17. Upon the termination of this agreement as aforesaid, all machines that may have been installed by the first party for the benefit of the second party shall be released and discharged from this

lease, and the right of possession thereof shall immediately revert in and be restored to the first party, who, by itself or its agents, may enter the premises of the second party or of the latter's sub-lessee, and upon the premises of all persons claiming under the second party, and take or remove the machines without being guilty of trespass or tort; or, the first party may pursue its proper remedies at law or in equity against the second party or against any sub-lessee of the latter, or the persons in whose possession the machines or any parts thereof may be found. And on the termination of this agreement for any default or breach, the second party shall have no claim or right to the repayment by the first party of the whole or any part of any sum which the second party may have paid to the first party under the terms and conditions of this agreement.

18. This agreement shall continue and be in full force and effect until the expiration of the last patent of the United States, now or hereafter owned or controlled by one of the parties to this agreement, relating to said Point or Spot welding or to machines used in connection therewith; it shall likewise continue so long as the second party sub-leases said machines or makes any other equally profitable disposition of machines for Point or Spot welding.

19. The first party further covenants and agrees that if the second party shall have fully complied with all the terms and conditions in this agreement set forth, but not otherwise, then, upon the expiration of this agreement, the second party shall have the privilege of purchasing said machines from the first party by the payment therefor of one dollar (\$1); and that upon such purchase, the first party will transfer the property in said machines to the second party by proper bill of sale.

20. All the rights, interests, obligations and remedies, either vested in or imposed upon either of the parties to this agreement, shall be deemed to respectively belong to and be enforceable by the successors and assigns of either of the parties to this agreement.

21. It is hereby stipulated and agreed that whereas under the above mentioned contracts dated November 15, 1904, March 15, 1905, November 3, 1905, November 27, 1905, January 1, 1906, November 13, 1906, and December 1, 1906, certain rights have been granted to the American Pulley Company of Philadelphia,

Pennsylvania, the American Fork & Hoe Company, of Cleveland, Ohio, and the American Electric Welding Company, of New York, N. Y., said rights shall not be affected or impaired by the substitution of this contract for the aforesaid prior contracts, and the rights and obligations of the parties hereto, arising out of and in respect to the rights granted to the three companies above named, shall continue to be governed by the aforesaid prior contracts as fully and completely as if this contract had not been made; except as thus provided, said prior contracts shall not remain in force and are superseded by this present contract.

In witness whereof, the parties of the first and second parts have caused this agreement to be signed by their respective Presidents, and their corporate seals to be hereunto affixed, attested by their respective Secretaries, the day and year first above written.

THOMSON ELECTRIC WELDING COMPANY,

[Seal]

By B. F. Spinney, President.

Attest: W. O. Dodge, Secretary

Party of the first part.

UNIVERSAL ELECTRIC WELDING COMPANY,

[Seal]

By M. Lachman, President.

Attest: Reginald Hawley, Secretary,

Party of the second part.

State of Massachusetts,

County of Essex, ss.

On this 26th day of February, 1909, before me personally came Benjamin F. Spinney the President of the Thomson Electric Welding Company, with whom I am personally acquainted, who, being by me duly sworn, said that he resided in the City of Lynn, Mass., that he was the President of the Thomson Electric Welding Company, that he knew the corporate seal of said Thomson Electric Welding Company; that the seal affixed to the said instrument was such corporate seal; that it was affixed by order of the Board of Directors of said Thomson Electric Welding Company; and that he signed his name thereto by like order as president of said Thomson Electric Welding Company.

WM. H. BATES,

[Seal]

Notary Public.

State of New York,

County of New York, ss.

On this 27th day of Feby 1909, before me personally came Maurice Lachman, the President of the Universal Electric Welding Company, with whom I am personally acquainted, who, being by me duly sworn, said that he resided in the city of New York, that he was the President of the Universal Electric Welding Company; that the seal affixed to said instrument was such corporate seal; that he signed his name thereto by like order as President of the said Universal Electric Welding Company.

ALEX. B. WRIGHT,

[Seal]

Notary Public. N. Y. Co. 420.

Following is the Schedule hereinbefore referred to:—

#### Schedule.

Numbers.	Marks.	Description.
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#### Exhibit B.

This agreement, lease and license made this      day of      1909, by and between the Universal Electric Welding Company, a corporation duly organized and existing under the laws of the State of New York, hereinafter called the "Lessor", and      a corporation duly organized and existing under the laws of the State of      hereinafter called the "Lessee", witnesseth,

Whereas the lessor is engaged in the development of the art of electric welding, owns certain letters patent and inventions pertaining to said art, and controls certain other letters patent owned by the Thomson Electric Welding Company, among which is included letters patent, No.      to Thomson Electric Welding Company, assignee of Adolph F. Rietzel, and

Whereas, the Lessee desires to acquire the right to use in the practice of said art, welders furnished by the Lessor, specified in the schedule hereinafter contained, for the purpose hereinafter named, and for that purpose only at the Lessee's factory at

Now, therefore, in consideration of the premises and the mutual promises hereinafter contained; it is agreed as follows:

1. The Lessor shall ship to the Lessee the welder specified in said schedule in about      from receipt of this agreement duly exe-

cuted by the Lessee. The Lessee hereby authorizes the Lessor to insert the numbers of the welder shipped and such other description thereof as may be necessary in the schedule hereinafter mentioned after the welder has been shipped.

2. The Lessee agrees to furnish a single phase, 20,000 watts, 60 cycles, alternating current at 220 volts, to said welder, and to furnish additional adequate current for additional welders when installed, and to do all the necessary wiring according to the directions of the Lessor.

3. The Lessee agrees to pay the freight and forwarding charges to its factory and to assume the risk of any loss or damage to the welder by fire or other casualty (but shall not be liable for ordinary wear) and to pay any such loss or damage forthwith to the Lessor, until the welder is accepted and the initial rental paid.

4. The Lessee agrees to pay the Lessor for initial rental as set out in the schedule, thirty days after shipment of the welder from the Lessor's factory, and the Lessor does hereby lease and let to the Lessee from and after receipt of said initial rental by the Lessor, subject, however, to the terms and conditions of the agreement, the welder specified in the schedule hereinafter contained, this lease and license to continue in force until the expiration of all patents which the lessor owns or controls embodied in the machine or involved in its use or the result of its use.

5. The Lessee in addition to the above mentioned initial rental, agrees to pay the Lessor as continuing rental to the royalty the sum of            annually, in quarterly instalments of            each, January, April, July and October first of each and every year during the continuance of this lease and license.

6. Said welder is leased for use in the Lessee's factory at for the sole purpose of welding by electricity the following articles, to be made in the Lessee's factory, to wit: —  
all as more particularly set out in the catalogue of the Lessee herein annexed and made a part of this agreement.

It is understood by the Lessee that the Lessor has heretofore leased and licensed to other parties similar welders for the welding by electricity of articles other than the above.

It being further understood by the Lessee that this lease and

license is not an exclusive lease or license for the welding of the articles above named.

It is further agreed in this connection that the Lessee shall not weld by means of said welder any articles other than those named above, unless by the written permission of the Lessor, and in case the Lessor does so grant permission to weld articles other than those named above, the Lessee shall discontinue the same at any time if requested by the Lessor.

7. The Lessee agrees not to permit the removal or defacing of any dates, numbers or inscriptions now or hereafter impressed on said welder or affixed thereto by the Lessor. The Lessee shall not permit the machine to be moved from its factory at        without notice in writing in advance thereof of such removal to the Lessor and then only for use by the Lessee at some suitable place within the United States.

8. Any additional welders which the Lessee shall elect to obtain of the Lessor shall be subject to all the conditions of this lease, the same as the welder originally installed hereunder, except as to the amount of initial rental and continuing rental or royalty which shall be agreed at the time of ordering said welders, and the numbers, marks, description, initial rental, annual rental or royalty, and the purpose for which said welders are to be used shall be entered in each such schedule; and the Lessee covenants and agrees not to use or permit others to use said additional welders or any part or parts thereof for any other purpose.

9. The Lessor and its agents shall at all reasonable times have convenient access to any welder subject hereto, with the right to examine and inspect the same and the use thereof.

10. Following is the schedule hereinbefore referred to: —

#### Schedule.

No.	Marks.	Initial Rental	Annual Rental or Royalty	Description and Use.
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11. At any time during the continuance of this lease after six (6) months notification, the Lessee may return any welder subject hereto, and upon payment to the Lessor of all sums due and accrued to the date of its return said welder may be released from this instrument, and upon the return as aforesaid, of all the welders hereunder and payment of all sums due thereof as aforesaid, this lease



shall be at an end, and all obligations of the parties hereto shall cease and terminate. Should any welder be totally destroyed by fire, or any other casualty so that no identifying parts thereof can be returned as above provided, then said welder shall be released from this instrument upon satisfactory proof of such destruction and the payment to the Lessor of all sums due and accrued to the date of said destruction, and upon proof of the destruction of all the welders, this lease shall likewise come to an end, upon the payment to the Lessor of all sums due and accrued under it to the date of said destruction.

12. It is understood that the welders are the subject of Letters Patent of the United States which the Lessor owns or controls, and the Lessee covenants and agrees not to duplicate said machines without the consent in writing of the Lessor.

13. This lease and license is personal to the Lessee herein named, and shall not be assigned by the Lessee without the consent in writing of the Lessor. But if the Lessee is not in default in any of the provisions of this instrument, the Lessor will upon written request, consent in writing to the assignment or transfer of the same to any person in the United States believed by the Lessor to be responsible, provided such party accepts this lease and license, and agrees in writing to faithfully keep and observe all the provisions and agreements hereof, the same as though it had been the party originally named as Lessee, in this instrument, or execute a new lease if the Lessor desires. Upon obtaining the Lessor's said consent and upon the execution and delivery to the Lessee of such acceptance and written agreement or new lease, all obligations of the Lessee herein named shall cease and terminate. But such assignment shall not be made until the Lessor shall have determined to its satisfaction that the proposed assignee is in fact responsible, and shall have so notified the Lessee.

14. The Lessee shall not sell or attempt to sell any welder or remove the same or assign this agreement, lease and license without the consent in writing of the Lessor.

15. The title in said welders shall in no case vest in the Lessee.

16. The Lessor agrees that it will at its own expense defend any suits that may be instituted by any third parties against the Lessee for alleged infringement of patents by reason of the use by the

Lessee of the said welders, provided that the Lessee shall have paid all royalties and moneys due to the Lessor and shall give the Lessor immediate notice in writing of the institution of such suits and shall permit the Lessor to defend the same, and shall give the Lessor all needful information in his possession and all reasonable assistance and authority to enable the Lessor to carry on the defence of such a suit.

The Lessor shall not be responsible for any compromise made without its written consent, nor shall it be bound to defend any suit when the same shall arise by reason of the use of welders or parts of welders not furnished by the Lessor.

The Lessee hereby acknowledges to be valid all Letters Patent which the Lessor owns or controls and also acknowledges the titles to said patents to be duly and legally vested in the Lessor.

It is further agreed that if at any time hereafter by the final order or decree of a court of last resort of competent jurisdiction, the Lessor shall be divested of its ownership of its Letters Patent hereinbefore referred to, and by the same order or decree such ownership shall be vested in another person than the Lessor, the Lessor will save said Lessee harmless from all damages that such Lessee may suffer by reason of such transfer of ownership by such order or decree of the court: but it is expressly understood that actual damages, and not resultant or exemplary damages, shall thus be made good to the Lessor by the Lessee.

17. In case the Lessee shall fail to comply with and fulfill any or all of the covenants, terms and conditions of this lease and license, then and in such event (except as herein otherwise provided) the Lessor may terminate this lease by giving written notice to the Lessee, which notice shall state specifically the cause for termination and rendering void of its lease and license and shall declare the intention of the Lessor to terminate the same. Such notice may be given by delivering the original or a copy thereof to said Lessee wherever found in the United States or to any agent or person authorized to transact business for the Lessee or by sending the same by registered mail to said Lessee at his last known post-office address.

And thereupon the Lessee shall have fifteen days after service or mailing of such notice as aforesaid, to remedy or remove the cause

or causes stated in said notice for terminating its license; and if within said fifteen days said Lessee does remove or remedy said cause or causes then said notice shall be withdrawn and this agreement continue in full force and effect.

And in case said Lessee does not so remedy or remove said cause or causes named within said period of fifteen days then this lease and license and this agreement shall be and become null and void from and after the expiration of said fifteen days.

18. Upon any termination of this lease and license for breach thereof the right of possession in any welders in the possession or control of the lessee shall immediately revert in and be restored and returned to the Lessor, and in case of the failure of the Lessee to return said welders to the Lessor within ten days after said termination, then the Lessor or its agents may enter the premises of the Lessee and all persons claiming under it and take or remove said welder or welders without being deemed guilty of any trespass or tort, or the Lessor may pursue its appropriate remedies at law or in equity against the Lessee or any persons in whose possession the welder may be found, and the Lessee shall have no right to the repayment by the Lessor of any sums paid under the terms of this agreement.

The revocation and annulling of this license for any cause shall not affect the rights to royalties or damages accruing to the Lessor from the Lessee.

19. It is made a special condition of this lease that the Lessee shall apply no improvement to or add to the operative elements of any welder obtained by it from the Lessor except with the written consent of the Lessor, nor shall the Lessee alter the mode of operation or arrangement of parts of any of said welders without similar consent of the Lessor.

20. The designation "welder" is herein used to refer in each case to a single apparatus for electric welding with all the machines and devices appurtenant thereto and used therewith.

21. All the rights, interests and remedies vesting in the Lessor under this instrument, and also all those which belong to it by right of ownership of any welders now or hereafter employed in or made subject to the terms of this agreement shall be deemed to belong to

and be enforceable by the successors and assigns of the Lessor in their own name or in the name of the Lessor.

In Witness Whereof, the Universal Electric Welding Company has caused its name to be signed and its corporate seal to be affixed by its president hereunto duly authorized and the said has caused these presents to be signed by its hereunto duly authorized, the day and year first above written, this agreement being for convenience executed in two like parts.

UNIVERSAL ELECTRIC WELDING COMPANY,

By President.

Lessor.

Attest : Secretary.

By President.

Lessee.

Attest : Secretary.

Agreement made this 22nd day of November, 1916, by and between Thomson Electric Welding Company, a corporation duly organized and existing under the laws of the Commonwealth of Massachusetts (hereinafter called the "Thomson Company") and Electric Welder Company, a corporation also organized and existing under the laws of said Commonwealth:

1. Thomson Company hereby assigns to Electric Welder Company all its contracts and rights relating to spot and point welding processes or spot and point welding machines, including the Harmatta Patent (United States Letters Patent, Number 1,946,066, issued December 3, 1912) and the Rietzel Patent (United States Letters Patent, Number 928,701), and all concessions, grants, and other rights and privileges relating to spot and point welding processes, and all its business relating to said spot and point welding processes or machines and the goodwill and benefit thereof.

2. Thomson Company assigns, sets over, and transfers all its rights under the contract entered into by it under date of February 26, 1909, with the Universal Electric Welding Company, a corporation duly organized under the laws of the State of New York (hereinafter referred to as "Universal Company") and all its rights under supplemental contracts with said Universal Company, dated June 17, 1909, and July 20, 1909.

3. Electric Welder Company agrees to save the Thomson Company harmless from the consequences of any failure by the Thomson Company to perform its obligations to Universal Company under said contracts of February 26, 1909, June 17, 1909, and July 20, 1909; provided, however, that Clause Fifteenth of said agreement of February 26, 1909, by which the parties to said agreement agree never at any time during the term of any Letters Patent issued to either of said parties relating to the art of electric welding or to machines to be used in connection therewith, to contest or question the validity of said patents or the sufficiency of either the specifications or the title of the owner thereof, shall remain in full force and effect as between the original parties to said agreement, as shall also all estoppels which have arisen under or resulted from the above contracts, with reference to either party contesting or questioning the validity of any patents owned or controlled by the other party; and the Electric Welder Company shall not be bound to save the Thomson Company harmless in the event of any failure on the part of the Thomson Company to perform the agreement contained in said Clause Fifteenth, or to be governed by said estoppels.

4. Thomson Company agrees with Electric Welder Company that it will fully perform its agreements contained in said Clause Fifteenth of said agreement between it and Universal Company, dated February 26, 1909.

5. Thomson Company agrees to transfer or cause to be transferred to Electric Welder Company all of the property and rights acquired by it from Toledo Electric Welder Company, a corporation organized under the laws of the State of Ohio.

6. Thomson Company hereby appoints Electric Welder Company its true and lawful attorney with power of substitution, in its own name or in the name of said Thomson Company, but at its own expense and for its own benefit, to bring such actions in law or in equity, and to do such other things as seem to it necessary or desirable or proper to secure to it the full advantage of the claims, rights, and property hereby conveyed, transferred or assigned by Electric Welder Company or intended so to be.

7. Thomson Company covenants and agrees to execute such further instruments and to do such other acts and things upon the request and at the expense of Electric Welder Company as said

Electric Welder Company may consider desirable to secure to it the full benefit and advantage of the claims, rights and property hereby conveyed, transferred or assigned to Electric Welder Company or intended so to be.

8. Electric Welder Company agrees to issue as fully paid to Thomson Company its common stock of the par value of \$500,000 or all of its common capital stock.

9. It is agreed that all of the covenants herein contained shall bind the parties and their respective successors and assigns; and shall be for the benefit of the respective parties, their successors and assigns to their own use forever.

In Witness Whereof, the parties hereto have caused their corporate seals to be hereto affixed and this instrument to be executed in their names and on their behalf by their officers thereunto duly authorized this 22nd day of November, 1916.

THOMSON ELECTRIC WELDING COMPANY,

[T. E. W. Co. Seal]

By J. W. Farley, President.

ELECTRIC WELDER COMPANY,

[E. W. Co. Seal]

By Geo. A. Cutter, Treasurer.

Agreement made this 22d day of November, 1916, by and between Universal Electric Welding Company, a corporation duly organized and existing under the laws of the State of New York (hereinafter called the "Universal Company") and Electric Welder Company, a corporation duly organized and existing under the laws of the Commonwealth of Massachusetts.

1. Universal Company hereby assigns, sets over and transfers to Electric Welder Company all its rights under the contract entered into by it under date of February 26, 1909, with Thomson Electric Welding Company, a corporation duly organized under the laws of the Commonwealth of Massachusetts (hereinafter referred to as "Thomson Company") and under supplementary contracts with said Thomson Company dated June 17, 1909, and July 20, 1909.

2. Electric Welder Company agrees to save the Universal Company harmless from the consequences of any failure on the part of the Universal Company to perform its obligations to Thomson Company under said contracts of February 26, 1909, June 17,

1909, and July 20, 1909; provided, however, that Clause Fifteenth of said agreement of February 26, 1909, by which the parties to said agreement agree never at any time during the term of any Letters Patent issued to either of said parties relating to the art of electric welding or to machines to be used in connection therewith to contest or question the validity of said patents or the sufficiency of either the specifications or the title of the owner thereof, shall remain in full force and effect as between the original parties to said agreement, as shall also all estoppels which have arisen under or resulted from the above contracts, with reference to either party contesting or questioning the validity of any patents owned or controlled by the other party; and the Electric Welder Company shall not be bound to save the Universal Company harmless in the event of any failure on the part of the Universal Company to perform the agreement contained in said Clause Fifteenth, or to be governed by said estoppels.

3. Universal Company agrees with Electric Welder Company that it will fully perform its agreements contained in said Clause Fifteenth of the agreement between it and Thomson Electric Welding Company, dated February 26, 1909.

4. Universal Company hereby assigns to Electric Welder Company all outstanding sub-contracts, sub-licenses and sub-leases made by it under said agreements of February 26, 1909, June 17, 1909 and July 20, 1909, with the Thomson Company together with the right to collect all sums accruing after January 1, 1917, upon such sub-contracts, sub-licenses and sub-leases.

Electric Welder Company assumes the obligations of the Universal Company under the sub-contracts, sub licenses and sub-leases hereby assigned.

5. Universal Company hereby assigns to Electric Welder Company all its rights and contracts relating to the point or spot welding process or to point or spot welding machines, including, without in any way limiting the generality of the foregoing, all its rights under Letters Patent of the United States and licenses thereunder and all concessions, grants, and other rights and privileges relating to point and spot welding processes, and all its business relating to said point and spot welding processes and machines and the goodwill and benefit thereof.

It is not intended that any of the patents owned and controlled by the Universal Company which relate to products made by the use of spot or point welding or the income derived therefrom shall be included in this assignment.

6. Universal Company hereby appoints Electric Welder Company its true and lawful attorney with power of substitution in its own name or in the name of said Universal Company, but at its own expense and for its own benefit to bring such actions in law or in equity and to do such other things as seem to it necessary or desirable or proper to secure to it the full advantage of the claims, rights and property hereby conveyed, transferred or assigned to Electric Welder Company or intended so to be.

7. Universal Company covenants and agrees to execute such further instruments and to do such other acts and things upon the request and at the expense of Electric Welder Company, its successors and assigns as said Electric Welder Company, its successors and assigns may consider desirable to secure to it, its successors and assigns the full benefit and advantage of the claims, rights and property hereby conveyed, transferred or assigned to Electric Welder Company or intended so to be.

8. Electric Welder Company agrees to cause to be delivered to Universal Company, its preferred stock of the par value of \$350,000, said stock to have preferences and privileges as follows:

Out of the surplus or profits arising from the business of the Company the holders of the preferred stock are entitled to receive dividends at the rate of seven (7) per cent per annum and no more payable quarterly on the first days of January, April, July and October in each year before any dividends shall be declared, set aside or paid upon the common stock, and such dividends on the preferred stock shall be cumulative, the first being payable April 1, 1917.

Until all the preferred stock shall have been retired, the Company shall set aside for the purchase or redemption of its preferred stock on the thirty-first day of December, in the year 1917, and in each year thereafter, one-third ( $1/3$ ) of the net earnings of the company after the payment of dividends on its preferred and before the payment of any dividends on the common stock for the fiscal year then last ended. The amount



so determined shall be set aside on the thirty-first day of December in each such year from and only from the surplus profits remaining after full cumulative dividends as aforesaid on the preferred stock shall have been declared and paid or provided for.

Out of any surplus or profits remaining after full cumulative dividends as aforesaid upon the preferred stock shall have been declared and paid or provided for and after the Company shall have complied with the above provisions requiring the setting aside of one-third ( $1/3$ ) of its net earnings and income for the purchase or redemption of its preferred stock, then and not otherwise dividends may be declared upon the common stock. Upon at least thirty (30) days' notice given by mail to record holders of preferred stock the Company may redeem the whole or any part of the preferred stock at any time or from time to time at the par value thereof (\$100.00 per share) plus dividends accrued or in arrears by lot or *pro rata* as shall be provided from time to time by resolution of the Board of Directors. The preferred stock shall be preferred as to both earnings and assets and in the event of any liquidation or dissolution or winding up of the Company the holders of the preferred stock shall be entitled before any distribution shall be made to the holders of the common stock to be paid in full the par value of their shares, together with all dividends accrued or in arrears; and the holders of the common stock shall be entitled to the exclusion of the holders of the preferred stock to share ratably in all the assets of the Company then remaining. The Company shall not without the affirmative vote or written consent of the holders of at least sixty (60) per cent in amount of this preferred stock outstanding create any shares of stock or issue any bonds having priority over or on a parity with this authorized preferred stock.

Upon any increase of the capital stock of the Company no rights shall accrue to the holders of any class of the stock of the Company to subscribe to any part of such increase, but the terms and manner of the disposition of such stock upon its issue may be as determined by the Directors in accordance

with the authority of the vote of a majority of holders of the common stock outstanding.

9. Electric Welder Company further agrees that it will either declare and pay the dividends on said preferred stock, if, as and when earned, in accordance with the preferences above set forth, or it will distribute *pro rata* among the holders of said preferred stock the proceeds of all contracts assigned by the Universal Company, as provided in clause 4 hereof; the proceeds of such contracts to the extent paid by the Electric Welder Company to the said holders of said preferred stock to be reckoned *pro rata* against any dividends on said preferred stock thereafter payable. If any disagreement shall arise between the Universal Company and the Electric Welder Company as to whether or not said preferred dividends have been earned, this question shall be determined by any certified public accountant appointed by the Universal Company, and the decision of such accountant shall, in the absence of fraud, be conclusive upon the Electric Welder Company.

10. It is understood and agreed that all the covenants herein contained shall bind the parties and their respective successors and assigns and shall be for the benefit of the respective parties, their successors and assigns and to their own use forever.

In Witness Whereof, the parties hereto have caused their corporate seals to be hereto affixed and this instrument to be executed in their names and on their behalf by their officers thereunto duly authorized the day and year first above written.

UNIVERSAL ELECTRIC WELDING COMPANY,

By Chas. H. Hyde,

Vice Prest. & Treas.

[U. E. W. Co. Seal.]

ELECTRIC WELDER COMPANY,

[E. W. Co. Seal.]

By J. W. Farley, President.

**PLAINTIFF'S EXHIBIT No. 12, PLAINTIFF'S TRANSLATION OF  
GERMAN PATENT TO BENARDOS No. 50,909, H. M. H., N. P.**

GERMAN PATENT No. 50,909, NIKOLAS VON BENARDOS

Patented from May 8, 1889

Issued February 19, 1890

**PROCESS OF OPERATING UPON METALS BY HEATING THEM LOCALLY  
BY ELECTRICITY**

This invention relates to a new application of the heretofore known Joule's law of electricity. The metals to be operated upon, preferably pieces of small dimensions, are brought into contact with a fire resisting, comparatively poor conductor of electricity (graphite, prepared carbon, mixtures of alumina with carbon, magnesium, iridium, carbon with thin metal coatings) while this conductor is traversed by an electric current of such strength that it acquires that temperature which is exactly required for the desired operation upon the metals.

The process may serve to directly weld together relatively thin metal sheets and rods, of like or of different metals; to effect the joining of metals with the use of solder; to bring metal objects or parts to a definite temperature for the purpose of hardening and to anneal hardened objects by heating them to a certain temperature.

This process is clearly distinguished, both from the point of view of the inventive idea on which it is based and from that of its mode of operation, from the prior Benardos process of working metals by the direct employment of the electric arc, as well as from the electric welding process of Elihu Thomson.

In putting into practice the inventive idea defined above, a variety of simple apparatus may be used, from the description of which the characteristics of the invention will be more particularly understood.

To weld together two thin sheets, they are conductively connected by a flexible cable with one of the poles of a powerful source of electricity of low internal resistance. With the other pole of this source of electricity is conductively connected a soldering iron K (see Fig. 1); this soldering iron is made principally of a metal (copper) which is a very good conductor of electricity, and carries in a suitable socket at its lower end, a small piece *w* of fire resist-

ing, poorly conducting material; it is with this piece that the operation on the work is performed.

At its other end the body of the soldering iron is provided with a handle which protects the hand of the workman from the effects of the heat and electricity.

The poor conductor *w* being brought into contact with the metal pieces *A'*, *A''* to be operated upon, the circuit is closed and a considerable portion of the electrical energy from the source of current is converted into heat in the poor conductor *w*, which soon begins to glow. By cutting resistance out of the circuit with the aid of a rheostat *C*, Fig. 1, the temperature of the piece *w* is raised until the metal to be operated upon begins to melt. Then, while moderate pressure is applied, either the electric soldering iron is moved along the seam to be produced or else the metal piece to be operated upon is moved along under the stationary soldering iron. When the operation has been completed, the current is interrupted by a switch and then the soldering iron is removed from the metal.

To provide a stable support for the pieces of metal to be operated upon, they are either laid upon a fireproof support which is a poor conductor of heat (asbestos), or else such a poor heat conductor is pressed against the work on the other side by a suitable device. In certain instances, however, it may be preferable, to produce resistance against the pressure of the soldering iron by placing the pieces to be operated upon upon a support (metal) which conducts the heat away rapidly.

For certain operations to which the present invention is applicable, it may be preferable to employ two opposed soldering irons, one of which is connected to the positive pole, and the other to the negative pole of a source of electricity, the two soldering irons being insulated from each other.

Fig. 2 shows, in plan, elevation and end view, an apparatus designed to carry out the process in the manner just described. Two soldering irons *K'*, *K''*, are united in a sort of shears or pincers, both being pivotally mounted at *C*. The passage of the current from one soldering iron to the other through the pivot *C* is prevented by insulating interposed layers. Binding screws *D'*, *D''*, receive the ends of the flexible cables connected to the poles of the source of electricity. The current thus flows from *D'* through

K<sup>1</sup> to  $w^1$ , from this piece  $w^1$  of poorly conducting, fire resisting material through the metal to be operated upon to block  $w^{11}$ , and returns through K<sup>11</sup> and D<sup>11</sup>, passing through a rheostat to the source of electricity. H<sup>1</sup> and H<sup>11</sup> are the wooden handles, and E is a spring by which the two pieces  $w^1$  and  $w^{11}$  are pressed together.

Fig. 3 shows an apparatus which is very similar to that shown in Fig. 2. The soldering irons are here mounted on a standard from which they are, however, insulated by non-conducting, interposed layers D<sup>1</sup> and D<sup>11</sup> are here again the binding screws to which the current conductors are connected. The upper soldering iron is hinged at I and G is a slidable weight by which the upper soldering iron is pressed against the lower one. F', F'' are two guide rollers, or else two rolls which, besides guiding, serve to smooth the soldered seam as well as to feed and guide the work.

Fig. 4 illustrates a simple apparatus designed for welding rod-shaped objects end to end. Two standards A<sup>1</sup>, A<sup>11</sup>, which are connected by binding screws D<sup>1</sup>, D<sup>11</sup>, with the poles of the source of electricity, carry at their tops two hinged covers B<sup>1</sup>, B<sup>11</sup>, containing pieces W<sup>1</sup>, W<sup>11</sup> of poorly conducting, heat resisting material between which the current flows from one standard to the other. These pieces of poorly conducting material are conductively connected, one with the metal of the one standard and the other with the metal of the other standard, in order to give them proper resistance when of small cross section, they are enclosed in jackets of fire-brick or soapstone in the covers B<sup>1</sup>, B<sup>11</sup>. The pieces of poorly conducting material are provided with a groove corresponding to the cross section of the pieces to be operated upon.

When an electric current enters at D<sup>1</sup>, it flows through A<sup>1</sup>, the poorly conducting piece W<sup>1</sup> and the work E<sup>1</sup> to the block W<sup>11</sup>, thence through A<sup>11</sup> and out at D<sup>11</sup>; the pieces W<sup>1</sup>, W<sup>11</sup> are thereby caused to glow and cause the heating of the metal piece to be operated upon.

Fig. 5 shows a similar device designed for butt welding wires. The wires to be joined are placed between the jaws W<sup>1</sup>, W<sup>11</sup> of poorly conducting, fire resisting material of suitable shape, through which the current flows as in the devices described before. This apparatus comprises a spring E by which the upper jaw is pressed against the lower. To reduce the loss of current heat by radiation,

the main part of the apparatus is enclosed by a jacket M, the fire resisting, insulating and poor heat conducting material, the jacket having suitable openings for the work to pass through.

Fig. 6 illustrates a device which is distinguished from those hereinbefore described in that the current does not pass through the metal itself to be operated upon. The electric soldering iron is, moreover, so constructed that the electric current flows through a piece of poorly conducting material in a similar way as through the filament of an incandescent lamp and this brings the poorly conducting material to incandescence. In Fig. 6, two soldering irons K<sup>I</sup> and K<sup>II</sup> are connected in parallel and combined in one soldering pincer. Between the two poorly conducting pieces W<sup>I</sup> W<sup>II</sup>, heated by the current to incandescence, the metal pieces to be operated upon are guided by hand or by two guide rollers F<sup>I</sup>, F<sup>II</sup>. This modification has the advantage that the pincers can be opened and the metal to be operated upon removed from the soldering device even when the circuit has not previously been opened, without the formation of an electric arc or spark between the metal and the soldering device.

#### Claims

1. Method of operating upon metals by local heating, the heat being generated by raising to incandescence, by the passage of an electric current, bodies of poorly conducting material (graphite, carbon mixtures of fire resisting, non-conducting and conducting substances), and bringing them into contact with the work to be operated upon.

2. To practice the method defined in claim 1; a) The devices represented in Figs. 1, 2, 3, 4 and 5, which can serve for welding and soldering like or different kinds of metal, or for hardening or annealing objects, and which are characterized by the fact that an electric current raises to incandescent fire resisting, poorly conducting bodies to be operated upon. b) The inventive apparatus represented in Fig. 8, which is based on the arrangement whereby the work to be operated upon is brought into contact with one or more fire resisting, poorly conducting bodies, raised to incandescence by an electric current, which, however, does not flow through the work to be operated upon itself.

CHART SHOWING COMPARISON OF  
HARMATTA'S PATENT NO. 1046066  
WITH THE PREVIOUS ART

H. H. H.  
Notary Public

[illegible]

PATENTS OF THE PREVIOUS ART		ELECTRIC WELDING		NOT ELECTRIC WELDING	
DATE OF INVENTION	NAME OF INVENTOR	DATE OF INVENTION	NAME OF INVENTOR	DATE OF INVENTION	NAME OF INVENTOR
	BENARDOS		COFFIN		BENARDOS
	363320		437571		(GER) 50909
			THOMSON		496019
			BLANCHARD		466266
			LEMP		531197
			BURTON		647694
			THOMSON		396015
			THOMSON		347140
			THOMSON		347141
			ROBINSON		574942
			KLEINSCHMIDT		616436
			THOMSON		444928
			LEMP		553923
			PERRY		670808
			PARKINSON		(BR '94) 14536
			HARMATTA		APPLICATION
			HARMATTA		





**PLAINTIFF'S EXHIBIT No. 15, COPY OF SILESIA-THOMSON  
CONTRACT, G. C. B., N. P. and Sp. Ex.**

This agreement made and entered into this 3rd day of April, 1912, between Eisenhutte Silesia Aktien-Gesellschaft of Berlin, Germany, a corporation duly organized and existing under the laws of Germany (hereinafter called the Silesia Co.), party of the first part and Thomson Electric Welding Company, a corporation duly organized and existing under the laws of the State of Massachusetts, U. S. A. and having an office in the City of Lynn, Massachusetts (hereinafter called the Welding Co.), party of the second part :

Witnesseth that,

Whereas, the Silesia Co. owns or controls an invention relating to certain improvements in Electric Welding alleged to be made by one Johann Harmatta of Szepesvaralja, Hungary and for which invention said Johann Harmatta did apply for letters patent of the United States, the application being filed in the United States Patent Office on or about the 3rd. day of December 1903 and bears S. N. 183,677 ; and

Whereas, the Silesia Co. did, by a certain instrument in writing dated the 3rd. day of December 1904, enter into an agreement with the National Enamelling & Stamping Company, a corporation of New Jersey, granting unto it certain rights connected with a certain electric welding process or processes useful in the manufacture of enamelled and tinned ware and metal goods in and for the United States ; and

Whereas, the Welding Co., is desirous of acquiring the said invention, together with the application for patent and the letters patent to be granted therefor, of the said Johann Harmatta in and for the United States and is also desirous of acquiring all the rights and duties of the Silesia Co. under its said agreement with the National Enamelling and Stamping Company ;

Now Therefore, to all whom it May Concern

Be it known that for and in consideration of the sum of Five (5) Dollars by each of the said parties hereto to the other in hand paid, the receipt of which is hereby acknowledged, and of the mutual

covenants and agreements hereinafter expressed, the parties hereto have agreed as follows :

First : The Silesia Co. agrees to deliver to the Welding Co. an assignment in the form submitted duly executed by the said Johann Harmatta transferring the said invention, application for patent and letters patent to be issued thereon in and for the United States to said Welding Co.

Second ; The Silesia Co. further agrees to deliver to the Welding Co. an assignment in the form submitted duly executed by it and conveying to the Welding Co. all the rights it may have to the said invention of said Harmatta for the United States.

Third : The Silesia Co. further agrees to deliver to the Welding Co. an assignment in the form submitted duly executed by it and conveying to the Welding Co. all its rights and duties under the said agreement with the National Enamelling & Stamping Company.

Fourth : The Welding Co. agrees to pay to the Silesia Co. immediately upon the delivery to it of the executed assignments referred to in the first, second and third clauses of this agreement the sum of Seven Thousand Five Hundred (7,500) Dollars in Cash.

Fifth : The Welding Co. further agrees to pay to the Silesia Co. a further sum of Twenty Thousand (20,000) dollars immediately upon the issue of a United States patent to the Welding Co. for the said invention and application for patent of said Johann Harmatta provided said patent is granted with the present claim 1 of the Harmatta application or a claim of equal scope therewith. For identification said claim is as follows :

"The process of electrically welding thin metallic sheets, which consists in introducing the sheet metal parts to be welded between electrodes, pressing said electrodes firmly together and closing the circuit, whereby the specified small round, very sharply defined place of welding which answers the purpose of a rivet is obtained, substantially as set forth."

Sixth : The Welding Co. covenants and agrees to vigorously prosecute said application for patent at its own cost and expense and to use its utmost endeavours and those of its legal advisors and attorneys to secure the grant of said patent with a claim of the scope defined in the fifth clause hereof.

Seventh: The Silesia Co. covenants and agrees to in every manner assist the Welding Co. and its attorneys in the endeavor to secure said patent with such scope and in this connection covenants and agrees to assist in securing said Harmatta's signature to all affidavits, oaths or other papers which may be required to this end, but at the expense of the Welding Co.

Eighth: It is mutually covenanted and agreed that if the grant of a patent for said invention with a claim the equivalent in scope to that defined shall be finally and definitely refused by the Patent Office, the Welding Co. will still have title to whatever patent of inferior scope, if any, may be granted without making the further payment of Twenty Thousand (20,000) Dollars specified in the fifth clause hereof, the object of this clause being to prevent the necessity of paying the further sum specified for a patent of inadequate and practically valueless scope.

Ninth: Notwithstanding any of the provisions hereinabove contained the Welding Co. hereby covenants and agrees that the Silesia Co. and its licensees shall have the unrestricted right and privilege without any compensation to the Welding Co. to import into the United States all and any articles and merchandise manufactured under and in conformity with the invention hereinabove described or any Patent or Patents granted or to be granted thereon and the Welding Co. hereby gives and grants unto the Silesia Co. and its licensees an irrevocable and permanent license to so import into the United States all and any of such articles and merchandise manufactured as hereinabove stated.

Tenth: The Welding Co. covenants and agrees that both itself, its successors and assigns or licensees will under its patents not cause any impediments in any way whatever to the import of welded goods into the United States of America so that neither the Welding Co. nor its successors and assigns or licensees being once in possession of the patents for electric welding will have no right whatever to prevent, impede or disturb the import of goods having been welded in this way into the United States of America.

Eleventh: The Welding Co. covenants and agrees to inform the Silesia Co. continually and promptly as to the progress of the patent negotiations and to let the Silesia Co. know at once if the pat-

ent has been granted with a claim equivalent in scope to that defined or only a patent of inferior scope.

Twelfth: The Welding Co. covenants and agrees to protect the Silesia Co. against any claims which the National Enamelling & Stamping Company may have under her agreement that has been assigned to the Welding Co.

Thirteenth: The Welding Co. undertakes to make all and any transfers or assignments of their rights under this agreement subject to the rights and licenses granted by this agreement to the Silesia Co.

In Witness Whereof, the parties hereto have executed this agreement the day and year first above written.

EISENHUTTE SILESIA, AKTIEN-GESELLSCHAFT.  
By Winkler.

THOMSON ELECTRIC WELDING COMPANY.  
By Chas. F. Tischner Jr., Attorney.

**PLAINTIFF'S EXHIBIT 16, SILESIA AGREEMENT WITH  
NATIONAL ENAMELING & STAMPING CO.  
OF DEC. 3, 1904.**

This Agreement made this 3rd day of December 1904, between Eisenhutte Silesia Aktien-Gessellschaft of Berlin, Germany organized under the laws of Germany, party of the first part, hereinafter designated Silesia Company — and the National Enameling & Stamping Company, organized under the laws of the State of New Jersey and carrying on business at No. 81/83 Fulton Street, in the City, County and State of New York, party of the second part, hereinafter designated the Nesco Company,

Witnesseth as follows :

I. Whereas the Silesia Company possesses a certain electric welding process or processes useful in the manufacture of enamelled and tinned ware and metal goods.

Whereas application has been made for or on behalf of the said Silesia Company for Letters-patent of the United States, covering certain portions or details of said electric welding process or processes and

Whereas the said Nesco Company desires to obtain for themselves the advantages of the said process for use in their factories.

Now Therefore, it is covenanted and agreed by and between the said parties as follows :

II. The said Silesia Company hereby sells and the said Nesco Company hereby purchases the exclusive right for the United States of America to weld all kinds of handles, lugs, ears, eyes, hooks, sockets, spouts and lips to their ware by the electric welding process of the Silesia Company,— upon the following terms and conditions :

III. The Nesco Company shall pay to the Silesia Company during the next fifteen years Three Cents per gross pieces of ware manufactured by the Nesco Company, by and after the electric welding process.

For this purpose, the Nesco Company shall every quarter of a year, inform the Silesia Company by registered letter, how many pieces of ware have been made in all their factories by and after the electric welding process. The Director of the Silesia Company

shall have the right to examine the correctness of the number of pieces given in the Books of the Nesco Company. The amount of money resulting from the number of pieces of ware, ascertained in this way, shall be paid every quarter of a year to Messrs. Hallgarten & Company, Bankers of No. 5 Nassau Street, Borough of Manhattan, City of New York for and on account of the Silesia Company.

IV. The process of electric welding forming the subject matter of this agreement is intended as a substitute for riveting or fastening in any other manner handles, lugs, ears, eyes, hooks, sockets, spouts and lips to iron and metal ware, and if such conjoining shall be done by electric welding, it is understood and agreed that this contract shall include the same and apply thereto.

V. In consideration of the payment mentioned under Par. III. of this agreement of three cents per gross pieces of ware by the said Nesco Company, the said Silesia Company further covenants and agrees to furnish and give to the said Nesco Company the benefit of the experience acquired by the said Silesia Company in connection with the use of the said electric process for fixing handles etc. on iron and metal ware.

VI. It is further agreed by and between the parties hereto that the Nesco Company shall pay Ten Thousand Dollars to the said Silesia Company as earnest money. This sum of Ten Thousand Dollars, to be paid at once and in advance shall be accounted for against the payments of three cents per gross pieces of ware, as laid down in Par. III. of this agreement.

The Silesia Company shall instruct the representatives of the Nesco Company in the operation of fastening handles by the electric welding process, until such time, as said Silesia Company shall conclude that the said process has been fully demonstrated and the said representatives fully instructed.

VII. The parties hereto further agree, at any time during the next fifteen years, to mutually exchange experience and information gained and acquired during the practical use by them and either of them, of the said electric welding process, applied to the operation of fastening handles on said iron and metal ware,— and while the said Nesco Company and the said Silesia Company or either of them, are using the electric welding process and that for this purpose either of the said Companies shall have the right through its

authorized representative or representatives to enter any of the factories of the other Company and to inspect and study the respective departments in which the process of electric welding is employed.

It is understood and agreed that the said Silesia Company shall communicate or sell their experience to nobody else in the United States, but to the said Nesco Company and that the Nesco Company shall communicate or sell their experience to nobody else in Europe, but to the said Silesia Company.

It is also agreed by and between the parties hereto that the Silesia Company will not at any time during the said term exercise or use or authorize others to exercise or use the said invention within the United States of America, without the consent in writing of the Nesco Company first having been obtained. Moreover, it is agreed that the said Nesco Company shall not grant sub-licenses without the written consent of the Silesia Company and in case such consent is obtained, the said Silesia Company and the Nesco Company shall participate in equal shares in all sums realized from the grant of such sub-licenses.

VIII. It is further agreed by and between the parties hereto that in the event of the granting of Letters-patent of the United States applied for, as herein recited, full and complete license and right to make and use the invention or improvement thereby allowed for the operation of fastening handles on iron and metal ware — in the factories of the said Nesco Company, shall be granted by the Silesia Company to the said Nesco Company.

And it is further understood and agreed that in case any infringement of the said patent should be committed by any person or persons within the United States of America or in case the Nesco Company should be made responsible for using the said invention in the United States of America, the said Nesco Company shall notify at once the Silesia Company, who have to determine at once whether or not the Nesco Company shall commence proceedings for such infringement or defend any action instituted against them. If the Silesia Company so determines, they have to pay the costs of such proceedings, unless otherwise agreed upon; it is, however, expressly understood and agreed that in the event of the granting of Letters-patent of the United States applied for as herein recited, the Nesco

Company shall be entitled to stop payment of the Royalty, heretofore agreed, in case the Silesia Company allows such patent to lapse or to be declared null and void.

IX. Should either of the parties hereto obtain or acquire further or additional Letters-patent for improvements or inventions relating to the said operation of fastening handles by the electric welding process, the other Company shall have the right to use and employ such additional improvements or inventions as follows :

In the event of the Silesia Company securing such new and additional patents, the said Nesco Company shall have full and complete license and right to make and use the same in the United States ; and in the event of the said Nesco Company securing such new or additional patents, the said Silesia Company shall have the full and complete license and right to make and use the inventions or improvements in Europe.

X. The said Silesia Company not having perfected yet the electric welding process, by means of which sheets of iron, steel or metal of great thinness are welded together, as a substitute for seaming, joining or in any other manner putting together two or more parts of ware, agrees not to sell the right of using this electric process to any other firm, person or persons in the United States before having offered it on reasonable terms to the said Nesco Company.

XI. It is understood and agreed that the said Silesia Company shall deliver without payment to the Nesco Company two electric welding machines for fastening handles, not including motors.

In witness whereof the parties hereto have executed this agreement in duplicate the day and year first above mentioned.

EISENHUTTE SILESIA AKTIEN-GESSELLSCHAFT.

Witnesseth By



**PLAINTIFF'S EXHIBIT No. 28.**

In the United States District Court, District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

**AFFIDAVIT.**

State of Ohio,

County of Trumbull.

Fred P. McBerty being duly sworn, deposes and says as follows:

My name is Fred P. McBerty. I am 44 years of age and am Secretary and Treasurer of the National Electric Welder Co., at Warren, Ohio.

After leaving the revenue service of the government on December 7th, 1897, my discharge from the service being attached hereto as Exhibit K, I entered the employ of the Wm. Todd Co., at Youngstown, Ohio, where I remained for a few months and then entered the employ of the Warren Electric and Specialty Co. at Warren, Ohio, in the spring, I think in March, 1898. There I took charge of the power plant and machinery. The business of the company was the manufacture of incandescent lamps. I soon had the machinery of the plant in good condition so that it did not require all of my time and furthermore, the Company was desirous of undertaking the manufacture of some products which could occupy the factory during the summer when there was scarcely any lamp business. It was at the time debated whether the manufacture of electric fans or telephones should be taken up. It was decided then to manufacture electric desk fans and the design was started in the Spring of 1898, that is the same Spring that I entered the employ of that Company. That year, however, (1898), few fans were sold. The next year a considerable business was done in the fans as was also the case in 1900. In 1900 it was thought that a better business could be done if the Company also manufactured a cheaper fan. Up to this time a considerable quantity of brass had

been used in the manufacture of the fans, particularly the fan guard was made of brass rods and wire, and other parts were made of brass, and required considerable labor for buffing and finishing in addition to the cost of the brass itself. It was therefore proposed to make the fan guards, and other parts previously made of brass, of iron and to japan the whole. This was in the summer and fall of 1900 in preparation for the fan season of 1901. One of the difficulties in manufacturing this new cheaper fan was found to be that the fan guard rings could not be secured together satisfactorily with the methods that had been employed in connection with the brass rings of the previous fans. At this time I conferred with Mr. Evrah C. Lipps, who was with the Warren Electric and Specialty Co., and who had had some experience with electric welding previously. I recall also at this time we were considering the electric welding, that Mr. Edward Craft of the Company went to Freehold, N. J. to inspect a transformer which had been supplied by the Warren Electric and Specialty Co., to the Pneumatic Wheel Co. for use in an electric welding machine. This transformer which Mr. Craft inspected was one which had been sent to take the place of a smaller transformer which the Freehold concern had. There was also sent with this transformer, a regulator. In connecting up the apparatus, immediately after its arrival, there was considerable trouble so that Mr. Craft was sent to find out what the matter was. I have before me the transformer data book of the Warren Electric and Specialty Co. kept at that time, which shows that the first transformer (which was replaced) was shipped on June 27th, 1900 and was returned and turned over to the fan motor department on January 20th, 1901, and that the larger and regulating transformers were shipped on Sept. 27th, 1900.

The Warren Electric and Specialty Co. had entered upon the manufacture of transformers about the same time that they took up the manufacture of electric fans. I attach hereto a transformer test book which was kept by Henry W. Wiswell. The first record in this book of a transformer test was made on July 18th, 1899. This book is marked Exhibit L.

I may say here in order that the relations of the companies may

be understood, that the Warren Electric and Specialty Co. sold all of its business in electric fans and transformers to the Peerless Electric Co., retaining the incandescent lamp business which was afterwards sold to the National Electric Lamp Association. The Peerless Co. in turn sold its transformer interests to the Peerless Transformer Co. which in turn was succeeded by the Enterprise Electric Co., all of Warren, Ohio, and the Peerless Electric Co. retained the motor business.

Upon his return from Freehold, N. J., Mr. Craft had ideas about electric welding machines, and as a result of conversations with Mr. Craft and my previous consultation with Mr. Lipps, I decided that electric welding would be the best means of securing the ends of the iron fan guards together. I accordingly in the summer or fall of 1900, made a sketch of a proposed welding machine which original sketch I attach hereto and it is marked Exhibit M. From this sketch which is not drawn to scale and is not a working drawing, a welding machine was made and set up in the old frame building of the Warren Electric & Specialty Co. before the brick buildings for the Peerless Electric Co. were started. These brick buildings were begun in the Spring of 1902 at the time when the Peerless Co. was organized. I attach hereto as Exhibit N, the report made to the stock holders on July 31st, 1903, at the end of the first complete fiscal year of the company. I was a stock holder in this company and received the exhibit referred to in the usual course at about the time of the date which it bears (July 31st, 1903).

The organization of the Peerless Electric Co., its starting business, and the building of the new buildings for it, which took place in 1902, was impressed on me strongly as it marked a great change in the business in which I was engaged. Further I recall that in 1902 when the Peerless buildings were being constructed I was building a house of my own and obtained some of my materials along with those for the Peerless buildings. After my house was finished heating apparatus was put in and I attach hereto, marked Exhibit N', the bill for heating, supplies which were put in my

house on or about Sept. 20th, 1902, the date of the item in the bill. The bill was rendered on or about Dec. 19th, 1902.

The Exhibit M attached hereto, is in exactly the same condition now (except that it has become somewhat worn) that it was when it was made by me in the summer or fall of the year 1900 and no alteration or change whatever has been made in it.

This exhibit bears the statement "Welder for 1901 cheap guards". This statement is in my handwriting and was placed on the sketch at the time it was made, which was in the summer or fall of 1900, when preparations were being made for the manufacture of the 1901 goods. This exhibit M has been in my possession since last December when I obtained it from Evrah C. Lipps who took it at the time the welder was under way as I have described. The machine made in accordance with this sketch and set up in the old Warren Electric Company's building as I have described, was ready for use early in 1901 and was employed in manufacturing the 1901 goods. This machine remained in the use of the Warren Electric & Specialty Company and their successors the Peerless Electric Co. up to the time I left that concern in 1906. It was in operation by the Peerless Electric Co. at the time I left and I understand continued so for a number of years. A few years ago I am informed it was taken down because the Peerless Co. decided to buy their guards instead of making them, and the welding machine was placed in the stock room. It was there when I bought it in 1911 and has been in my possession at the works of the National Electric Welder Co. ever since. The machine operates now in the same way that it did in 1901 and is practically the same as it was then.

When the machine was ready for use, in the early part of 1901, I operated it at various times to demonstrate its capabilities as a welder. The whole subject of electric welding was a new one to me and I was desirous of finding out whether it would satisfactorily perform various operations of welding. I demonstrated to my own satisfaction and also that of others, that the machine would butt weld satisfactorily, that is, it would weld the abutting ends of bars together over the whole area of the ends, and also that sheets or

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plates of metal could be welded together in spots less in area than the overlapping portions of the plates. These welded parts could of course be duplicated, and these spots were held together as by rivets spaced apart. The spot welding was entirely satisfactory and thoroughly demonstrated the practicability of this form of welding. In performing the butt welding, the pieces to be welded together were secured in the welding clamps. The welding clamps were then moved towards each other until the ends of the stock abutted. The current was then turned through the abutting ends and maintained until a welding heat was secured at the joint. Pressure was then applied at the joint by forcing the clamps towards each other, the current being almost simultaneously cut off. This completed the weld. To make the welds in spots, copper bars were secured in the clamps of the machine to form electrodes. These electrodes had opposing points of about  $1/8''$  in diameter. The overlapped sheets to be welded together were then placed between the electrodes, the clamps were then moved toward each other until the electrodes touched the sheets or plates on opposite sides with a slight pressure. This localized the pressure at the spots where the electrodes were located and also localized the current or heat in the spot to be welded. The current was then turned on until the welding heat was secured and then the electrodes were forced together and the current cut off. The weld was then completed. It will be seen from this description that the butt and spot welding differed simply in restricting the size of the weld. The butt weld was a weld over the whole faces of the pieces welded together, while the spot weld was simply a lessening of this area when this was sufficient to hold the piece together so that the only difference between butt welding and spot welding is that in one case the whole contacting areas are welded together, while in the spot welding only a part of the areas are welded. The spot welding was simply a natural variation of the butt welding when the work was of such a nature as to require it. It never occurred to me or to anybody with whom I had anything to do, that there was any invention in making a weld as large or as small as you wanted to use, that is making a butt or spot weld. I have taken out many patents and if I thought

any invention could be involved in this spot weld I would have applied for it. I and my associates were very much surprised on noting that the Harmatta Patent for spot welding had been granted as it had not occurred to me or my associates that a patent could be secured on such a thing.

As I have before stated the Warren Company was in the latter part of 1900 and 1901, preparing to put out a cheap iron fan, and, as I have also stated, the welding machine which I devised and built (Mr. Craft superintended the actual building) was employed for butt welding the ends of the fan guard rings together. It occurred to me that the welding machine could also be used to cheapen these fans by employing it to secure the fan blades to the center arm by a number of spots which would take the place of the rivets which were previously employed. This was the only fan construction, or in fact any construction, which was employed by the company to which this character of weld was adaptable. In demonstrating the practicability of this idea I took one of the steel fan blades and centers and welded the blades to the center arm, each blade being secured to the arm by a number of welds in different spots. This was done by me in the spring of 1901, this being the time the machine was finished and its capability of butt welding the ends of the fan guard rings demonstrated.

I produce, attached hereto, as Exhibit O, a fan blade welded to an arm in a plurality of distinct spots which was welded by me in the spring of 1901 as I have described, and has been retained by me from that time to this. It has not been changed or altered in any particular. In this exhibit, the piece to which the fan blade is welded is the arm of the central spider of the fan, and originally this arm with three others, making four in all, were fastened to the hub. This particular fan blade which I have produced has been in my tool chest since the spring of 1901 as I have stated. The fan consisting of the four blades and centers was too large to put in my tool chest and so I cut off the arm with the blade as hereto attached to preserve as an illustration of how I had employed the welding. I often preserve in this way the first specimens of work which I have done as being interesting on that account.

The question of adopting the spot welding in place of the riveting on the cheaper fans was seriously considered and would have been adopted except that the fan blades and centers, which we already had in stock, had been punched for the rivets and it made a somewhat botched job to leave the rivet holes open and secure the blades to the spiders by spot welding. Furthermore, inasmuch as the punching had already been done there was no saving in spot welding over the riveting. Furthermore, the tools and jigs to perform the spot welding rapidly would have required a further expenditure. Moreover, this was in the month of February, which was well along in the fan season, so that it was impracticable to make a change over for that season so that it could only have been availed of for the next year. Furthermore, the riveted fans proved satisfactory and as they already had the tools and standard stock for building these fans, it was not thought advisable to provide a second set of apparatus and a duplicate set of unpunched stock for the spot welding of the cheaper fans. The result of all this was that it turned the scale in favor of the non-adoption of the spot welding for the fans, Mr. Gillmer, the Secretary and Treasurer of the Warren Company, refusing to consent to this additional outlay, especially in view of the fact that the margin of saving would not have been great in this case. The welder was continued in use by the Warren Company as a butt welder as I have described. The machine remained in use as a butt welder by the Peerless Company after its organization, first at the works of the Warren Electric & Specialty Co., and it was later moved to the works of the Peerless Company when they were constructed in 1902, and was in use there up to three or four years ago. There was no work that we could use spot welding on advantageously, which accounts for the use of the machine for butt welding only in the regular commercial work.

I also attach hereto, marked Exhibit P, a fan center arm welded in a number of distinct spots to a piece of sheet steel. This Exhibit was made by me in the spring of 1901 at the time I was demonstrating the capabilities of the welding machine. This is a piece which happened to be made by me at the time I was first using the machine and I happened to preserve it as a specimen of my first

work in this line. It has been in my possession since the spring of 1901 and has not been changed in any respect.

I recall distinctly that in the spring of 1901 when I was operating the welding machine as I have described, that I sent for Frank G. Brown to see if he would not enter the employ of the Warren Electric & Specialty Co., I recall that he was at that time in the employ of the Packard Automobile Company, then known as the Ohio Automobile Co. and that he declined to come as he said a demand had been made by the machinists for a nine hour day. He said he thought this would be granted and that it was to his advantage to stay where he was. I recall that Brown's visit was on a Sunday when there was no current on, but I explained the welding machine and its operation for both butt and spot welding to him and showed him fan blades spot welded to center arms the same as Exhibit O hereto attached among other things.

I also distinctly recall that in the summer of 1901 when Eyrah C. Lipps was in the employ of the Trumbull Co. (when he visited me at the works of the Warren Electric and Specialty Co.) and also when he returned to the employ of the latter Company in the fall of 1901, I explained the welding machine and its operation, for both butt and spot welding to him. He was very much interested in the matter and we both from time to time would weld specimens (both butt and spot welds) and I explained to him that I thought the spot welding could be advantageously used for securing fan blades to centres and showed him specimens the same as Exhibit O hereto attached and the manner in which they were welded.

In order to give a more detailed idea of the welding machine as it existed in the spring of 1901, I attach hereto, two pencil sketches, marked Exhibits R and S respectively. The sketch Exhibit R is a top plan view and the Exhibit S is a longitudinal, vertical section through one of the movable clamping members. Referring to Exhibits R and S, 1 and 2 are two parts electrically insulated from each other but mechanically secured together so as to form the base plate of the machine. Upon the base plate of the machine the two clamps carrying arms, 3 and 4 are pivoted at 5 and 6. The fixed jaws 7 and 8 are secured to the arms 3 and 4 by bolts 9 and 10.



The movable clamp jaws 11 and 12 are slidably secured on the arms 3 and 4 by bolts 13 and 14 which extend through slots 15 and 16 in the clamp jaws 11 and 12. When the nuts are loose on these bolts 13 and 14 the jaws 11 and 12 can move back and forth toward and away from the fixed jaws 7 and 8. To force the movable jaws up so as to clamp the work between them the arms 17 and 18 are provided. These arms are pivoted at 19 and 20 to the arms 3 and 4 and have cams 21 and 22, which bear or press against the clamps 11 and 12, when the arms 17 and 18 are moved towards the left, and force these movable jaws towards the fixed ones to clamp the work. In order to move the clamps towards each other, to produce the welding pressure on the work, arms 23 and 24 are provided which are pivoted to the base plate at 25 and 26. These arms have cam ends 27 and 28 which, when the arms 23 and 24 are moved outwardly in opposite directions, come against the ends 29 and 30 and force them inwardly, thereby carrying the clamps towards each other. In the sketch are shown two pieces 31 and 32 in the clamps. If this is stock to be welded together the clamps are moved towards each other until the ends of the stock meet from one clamp to the other and until the welding heat is reached when they are pressed together, the current cut off, and the weld is completed. The clamps are then loosened to restrict the welding to a spot, that is to perform so-called spot welding, the bars 31 and 32 were made of copper and had their opposing ends made the size of the welded spot desired. These copper bars were secured in the clamps by forcing up the movable jaws and securing them by tightening up the nuts on the bolts 13 and 14, overlapped sheets of metal were then placed between the electrodes 31 and 32 and the clamps moved toward each other until the electrodes pressed upon the overlapping sheets on opposite sides. Current was then passed through the electrodes and overlapping sheets of metal from one clamp to the other, a welding heat was produced and then pressure was applied to force the heated metal of the plates together to form a weld which was about the size of the ends of the electrodes 31 and 32, and the current was cut off. The electrodes were then withdrawn by separating the clamps and the operation repeated in as

many spots as desired. Current is supplied to the clamps having jaws 8 and 12 by conductors 33 and 34 leading to one pole of the transformer while the current is supplied to the other clamp by means of conductors 35 and 36 leading to the other pole of the transformer. The welding machine which I built and operated at the factory of the Warren Electric and Specialty Company, Warren, Ohio, in the early part of 1901 was the same as that as shown in Exhibits R and S and was operated at that time to perform butt and spot welding in the manner as I have just described in connection with these Exhibits.

I distinctly remember that at that time the space between the clamp arms 3 and 4 was not sufficiently deep to permit the sheets to be welded together to extend sufficiently low-down when placed between the electrodes 31 and 32, when these electrodes were straight, and so we bent the ends of these electrodes upwardly so as to allow the sheets of metal to enter between the electrodes to a sufficient extent to place the weld at the spot desired. This machine was used as I have described for some years subsequent to 1901, but in the use of the machine it was found by the operator that after the arms 17 and 18 had been thrown to force the clamp jaws together they would reach their limit of movement in this respect and to all intents and purposes were secured to the arms 3 and 4. It became the practice to move these arms 3 and 4 by these levers 17 and 18 in forcing the clamps together to effect the weld and the arms 23 and 24 fell into dis-use, and being in the way were removed. I do not know just when this occurred but it followed in the natural course of use of the machine some time after it had been built in 1901. In the original machine the base plate was made in two pieces 1 and 2 which were separated by a piece of fibre, to insulate them, which extended substantially the whole length of the base plate. It was found however, that the drip from the welds under the pieces 31 and 32 was caught by the fibre and sometimes established a connection between the metal plates 1 and 2 which would require the cleaning out of this drip to get good operation of the machine. This hot drip would also burn the fibre. The fibre piece was therefore cut out directly under the spot where the weld was

made which afforded a larger clearance for the insertion of sheets to be welded and also prevented the accumulation of the drip. The machine was used in this condition by the Warren Electric and Specialty Company and their successors the Peerless Electric Company for electric welding up to about five years ago when, in order to improve the insulating qualities of the machine the base plates 1 and 2 were placed upon a plate of slate. Also the conductors 35 and 33 were omitted as it was found that the conductors 34 and 36 were ample to carry the necessary current. The machine is now in this condition in my possession at the works of the National Electric Welder Company in Warren, Ohio. These changes made as I have noted were minor details made with a view to simplifying the machine and making insulation more efficient, and did not change the manner of operation or the work produced, the machine being substantially the same and operating in the same way and producing the same work as when it was originally built in 1901.

I have seen various makes of machines used for spot welding and butt welding and in every case the butt welding machines could as well be used for so-called spot welding, it being merely a question of whether a large weld or a small weld is desired, and as to the securing of sheets together by welds in a number of separated spots this merely means that the making of a weld in one spot is duplicated a number of times.

FRED P. McBERTY.

Subscribed and sworn to before me this 9th day of October,  
A. D. 1913.

C. E. Stephens,

Notary Public in and for Trumbull  
County, at Warren, O.

[Notarial Seal]

**PLAINTIFF'S EXHIBIT 29.**

In the United States District Court. District of Massachusetts.  
In Equity.

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

**AFFIDAVIT.**

State of Ohio,

County of Trumbull, ss.

John S. Gilder being duly sworn, deposes and says as follows:—

My name is John S. Gilder. I am 38 years of age and reside in Warren, Ohio. I am at present employed by the Enterprise Electric Company at Warren, Ohio, as a transformer assembler.

Early in the year 1900 I came from the home of my parents in Kinsman, Ohio, and entered the employ of the Warren Electric & Specialty Company in Warren, Ohio. This was in the early part of the year 1900, in January or February, because I remember that it was cold and wintry.

When I first entered the employ of the Warren Electric & Specialty Company in 1900, the company was making its fan guards of brass. The rings of these guards at first had their ends secured together by inserting them in a sleeve and then securing them with solder.

Later it was the practice to dowel the ends of the rings together and then sweat them.

The next season, or the one after, that is in the year 1901 or 1902, the manufacture of iron fan guards was begun by the company. At first they tried brazing the ends of the iron rings for the guards together, but that was not satisfactory and the welding of the iron guard rings by electricity was begun.

This electric welding was started either the same season that the use of iron fan guards was begun, that is in 1901 or 1902, or it may have been the next season after that. I have given these dates entirely from recollection and have no papers or memoranda by which I can verify them.

I recall in a general way seeing the electric welding machine

which was used for welding the iron fan guards at the time I have mentioned. I recall this machine in a general way, but could not go into details regarding it. I recall that there were two short handles for pushing the clamp jaws together to secure the work in them, and there were two larger handles for pushing the clamps toward each other to bring the stock together to weld it. My work at the time was that of general utility man. I helped form the pieces for the guards in the shop and sometimes would assist in the welding. The only kind of welding which I remember seeing done on the machine at that time was the welding together of the ends of the stock to make the fan guard rings. It was only occasionally, however, that I was in a position to know what kind of work was being done on the machine so that other kinds of work and characters of welds may have been made which I knew nothing about.

I have, on October 7th, 1913, examined a welding machine at the works of the National Electric Welder Company at Warren, Ohio, and while I did not have sufficient to do with the machine so that all details were impressed on my mind, this appears to be the same machine that I saw used at the factory of the Warren Electric & Specialty Company for welding the rings of iron guards as I have described.

JOHN S. GILDER.

Subscribed and sworn to before me this tenth day of October,  
A. D. 1913.

C. E. Stephens,

Notary Public.

Trumbull County, Ohio.

[Seal]

**PLAINTIFF'S EXHIBIT No. 30.**

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

**AFFIDAVIT.**

State of Michigan,

County of Wayne, ss.

Evrah C. Lipps, being duly sworn, deposes and says as follows:

My name is Evrah C. Lipps; I am forty five years of age; and reside at 1131 Canton Avenue, Detroit, Michigan. I am employed by the Packard Motor Car Company, at their factory in Detroit, Michigan. Up to about a month ago I was night superintendent, but since that time, owing to the fact that the night shift was taken off, I have been assigned to the installing of a special tool system in the factory until such time as the night force shall be resumed. I have been in the employ of the Packard Company since three years ago last April. Up to the time I entered the employ of the Packard Company about three and a half years ago, I was employed since a boy in the electrical industries, having entered the employ of the old Brush Electric Company, in Cleveland, Ohio, when I was 15 or 16 years old; since that time I have been employed, up to three and a half years ago, in connection with the manufacture of electric lamps, motors, welding apparatus, transformers, and various other electrical apparatus. In addition to the Brush Electric Company, I have been employed by the Buckeye Electric Company, W. G. Avery, of the Avery Stamping Company, and the Warren Electric & Specialty Company.

I entered the employ of the Warren Electric & Specialty Company for the first time in January or February, 1898. This was a month or two before the date of my agreement for employment by the Warren Electric & Specialty Company, which agreement is dated March 2nd, 1898. A copy of the original agreement is attached hereto as Exhibit D. I further fix the date when I went with the Warren Electric & Specialty Co. for the first time by the

attached two telegrams, sent to me by the Warren Electric & Specialty Co. which are respectively dated January 7, 1898, and January 18, 1898, and which have been preserved in my possession since the dates mentioned. These telegrams relate to my entering the employ of that company which I did very shortly after the dates of the telegrams. These telegrams are marked as Exhibits "E" and "F". I left the employ of the Warren Electric & Specialty Company in the summer of 1900, and went to Cleveland, Ohio, where I engaged in the manufacture of electric fans on my account. Attached hereto is the time book (marked Exhibit "G"), which I kept during this work in Cleveland, in which time spent is marked beginning on August 20th, 1900, and continuing until April 29th, 1901, when I discontinued my Cleveland enterprise and went back to Warren, Ohio. I at first went to work for the Trumbull Manufacturing Company, where I remained but a few weeks, and in the early fall of the same year that I went back to Warren, that is, in 1901, I again went into the employ of the Warren Electric & Specialty Company, where I remained until I went into the employ of the Packard Motor Car Company, in Detroit, about three and a half years ago. As fixing the time when I went into the employ of the Warren Electric & Specialty Co. for the second time as in the fall of 1901, my oldest child was born on October 6th, 1901, and I had then re-entered the employ of the Warren Electric & Specialty Co., after I had left the Trumbull Co. This child was born almost exactly two years after my marriage which took place in the fall of 1899 in Warren, Ohio, where I was in the employ of the Warren Electric & Specialty Co. the first time. It was between the date of my marriage, and the birth of my first child that I went in business in Cleveland as before referred to.

During my first employment with the Warren Electric & Specialty Company, that is, from January or February, 1898, to the summer of 1900, I was employed in manufacturing incandescent lamp filaments, and was also connected with the manufacture of electric fans. During this time I was closely associated with Mr. Fred P. McBerty and we frequently talked over the matter of electric welding before I went to Cleveland to engage in business on my own account in 1900. I recall that Mr. McBerty made a sketch of an electric welding machine in connection with these discussions. I

saw Mr. McBerty make the sketch and I took it among other papers with me when I went to Cleveland, in 1900. This sketch has been in my possession ever since that time until I gave it to Mr. McBerty at his request last December. This sketch when I gave it to Mr. McBerty last December was the same as it was in every particular when it was made and when I took it with me to Cleveland in 1900, and had not been changed by any one in any respect whatever. I have not seen it since. I have, however, examined the sketch shown in photograph Exhibit "A" and attached to the affidavit of Mr. Frank G. Brown in this same matter and executed on October 6th, 1913, and the sketch shown in this photograph appears to be identical with the original sketch which I gave to Mr. McBerty last December.

When I was working with the Trumbull Company in 1901, as I have referred to, I frequently went to the works of the Warren Electric & Specialty Company to see Mr. Fred P. McBerty with whom I was very friendly and during these visits I saw an electric welding machine which was arranged as shown in the sketch given to Mr. McBerty last December and in the Exhibit "A" attached to Brown's affidavit above referred to. At the time of my visit to Mr. McBerty in 1901 this machine was used for butt-welding the rings of fan guards and I recall distinctly that on one of my visits I found Mr. McBerty changing the transformer which supplied current to the machine, the reason for this being that the transformer which had been used was not of large enough capacity to supply the current for welding the inner fan rings, so that the transformer became overheated and the change consisted in putting in a transformer of larger capacity so that sufficient current could be supplied. I also recall that at the time of my visits to Mr. McBerty while I was with the Trumbull Company that spot welding, as well as butt-welding was performed on this machine. By butt welding I mean the welding together of two pieces butted together end to end and welded over their whole abutting area. By spot welding I mean the welding together of thin plates or sheets which are overlapped and welded together at one or more spots which are less than the overlapping area. I attach hereto two thin pieces of sheet metal which are spot welded together at a number of spots, the same being marked "Exhibit H". These pieces of sheet metal



welded together were welded on the machine at the Warren Company's factory during one of my visits to Mr. McBerty while I was with the Trumbull Company. The actual operation of welding these pieces together was performed either by himself or Mr. McBerty, I do not remember who did this particular piece of work. I recall that Mr. McBerty and I together were welding various pieces of sheet metal together to observe the efficiency of the weld and I saved this Exhibit "H" as a kind of a sample.

The sheets welded together in this Exhibit were halves of armature lamination discs which were used by the Warren Company in the manufacture of the core for their fan motor armature. This Exhibit "H" has been in my possession ever since it was made in 1901, and is exactly the same now as when it was made, and has not been changed in any way whatever. With the transformer of larger capacity installed, this machine was in actual commercial operation from 1901 up to 1910. I understand that at the present time and since 1910 it has been in the factory of the National Electric Welding Company at Warren, Ohio, where it is used as occasion may require. The principal work for which the welder was used in a commercial way was the butt welding of the fan guard rings. At about the time I went back with the Warren Electric & Specialty Company, leaving the Trumbull Company, in the fall of 1901, I saw steel fan blades welded to the hub arms in a number of distinct spots. I saw the operation of welding the fan blades to the center arms in a number of spots as I have described performed upon the welding machine at the Warren Company, and I saw others that had been previously welded. In fact, at the times of my visits to Mr. McBerty while I was still with the Trumbull Company he had told me that he proposed the use of the spot welding of the fan blades to the centers in producing a commercial cheap grade of fans and said that he had already spot welded fan blades to the centers but as the times of my visits to the Warren Company were limited on account of my employment with the Trumbull Company and as none of these spot welded fan blades happened to be about I did not see this particular thing at that time but first saw the spot welded fan blades in the fall of 1901, about the time I went back to the Warren Company as I have described. The fan blades and center arm spot welded together and attached to the affidavit of Mr.

Brown above referred to as Exhibit "B" is identical with what I saw at the Warren Company in the fall of 1901, if in fact it is not one of those which I saw. I recall distinctly that in the structures which I saw in the fall of 1901, wherein the fan blades were spot welded to the center arms, the blades and arms were drilled for rivets which was the standard way of securing blades used by the company and I note that in the Exhibit "A" attached to Mr. Brown's affidavit these holes are present and the Exhibit is in all other respects the same as the structure I saw in the fall of 1901. I recall distinctly that both during my visits to Mr. McBerty while I was with the Trumbull Company and after I re-entered the employ of the Warren Electric & Specialty Company, in the fall of 1901, I had considered that the securing of sheet metal together by welding in spots as performed on the machine at the Warren Company was strong and reliable and adapted for practical use unless there should be some financial reason against it. So far as I know, however, the spot welding of the fan blades to the centers as proposed by Mr. McBerty was not adopted commercially by the Warren Company for the reason that the spot welding of the blades to the centers left the rivet holes which did not give a satisfactory appearance but looked like an unfinished job and the dies and punches for the fan blades and centers, with holes for the rivets, had already been made so that a new set of dies and so forth would have been necessary to produce a good looking spot welded job and furthermore, this would have necessitated the carrying of a double stock of parts by the company. On this account Mr. E. W. Gillmer, now dead, who was secretary and treasurer and manager of the Warren Company did not think that the spot welding of the fan blades, under the circumstances, would be a good financial proposition, and therefore refused to allow it to be put into the regular commercial output. Since 1901, when this welding was done as I have referred to to the present time I have often heard Mr. McBerty refer to spot welding and butt welding and know that both of us had in mind that either butt or spot welding might be used as would appear most advantageous under the circumstances of a given case. The demonstration of the spot welding in 1901, having clearly satisfied us all that the spot welding as well as the butt welding was practical and successful. In fact, the tests and

trials of the machine were as much to demonstrate the practicability of butt welding with it as to demonstrate spot welding and the proved success of the one followed as a natural consequence the proved success of the other as spot welding differs from butt welding simply in confining the current to a smaller area of the proposed surfaces, when of course, the heated area and the weld are correspondingly limited. I am informed that a patent has been granted upon so called spot welding and am very much surprised that this could be the case as it seems to me that the so-called spot welding is a natural variation from from butt welding according to circumstances which may require a larger or smaller area to be welded. Both Mr. McBerty and I have applied for and secured patents upon inventions and if we had thought that there could be any possible invention in so-called spot welding an application for a patent on it would certainly have been made. It is the commonest engineering expedient to make the welds large or small as reasons of strength or otherwise may make most advantageous. Many years previous to 1901, when I saw the welding on the machine at the Warren Company's factory as I have referred to, I myself, while in the employ of W. G. Avery, used electric arc welding and welded the pieces together at spots or over their entire opposed faces according to the circumstances governing the particular job and never believed that there was anything patentable in enlarging or restricting the welded area.

I attach hereto a sketch marked Exhibit "I" which shows the welding machine which I saw at the works of the Warren Electric & Specialty Company in 1901, as it was at that time. This sketch is substantially the same as the sketch Exhibit "A" attached to Brown's affidavit referred to above, but the photographic sketch was preliminary to the machine and therefore may differ in some slight and unimportant details from the sketch of Exhibit "I". Furthermore, this Exhibit "I" may have reference to numerals marked on it which I do not care to put upon the photograph.

In this Exhibit "I" the top figure is a top plan view, and the bottom figure is a longitudinal vertical section through one of the movable clamping members.

In this sketch Exhibit "I" 1 and 2 are two parts electrically insulated from each other but mechanically secured together so as

to form the base plate of the machine. Upon the base plate of the machine the two clamp carrying arms, 3 and 4 are pivoted at 5 and 6. The fixed jaws 7 and 8 are secured to the arms 3 and 4 by bolts 9 and 10. The movable clamp jaws 11 and 12 are slidably secured on the arms 3 and 4 by bolts 13 and 14 which extend through slots 15 and 16 in the clamp jaws 11 and 12. When the nuts are loose on these bolts 13 and 14 the jaws 11 and 12 can move back and forth toward and away from the fixed jaws 7 and 8. To force the movable jaws up so as to clamp the work between them the arms 17 and 18 are provided. These arms are pivoted at 10 and 20 to the arms 3 and 4, and have cams 21 and 22, which bear or press against the clamps 11 and 12, when the arms 17 and 18 are moved towards the left, and force these movable jaws towards the fixed ones to clamp the work. In order to move the clamps toward each other, to produce the welding pressure upon the work, arms 23 and 24 are provided which are pivoted to the base plate at 25 and 26. These arms have cam ends 27 and 28 which, when the arms 23 and 24 are moved outwardly in opposite directions, come against the ends 29 and 30 and force them inwardly, thereby carrying the clamps towards each other. In the sketch are shown two pieces 31 and 32 in the clamps. If this is stock to be welded together the clamps are moved towards each other until the ends of the stock touch. Current is then passed through the stock from one clamp to the other until the welding heat is reached when they are pressed together and the weld is formed. The clamps are then loosened and the welded stock removed. When it was desired to restrict the welding to a spot that is to perform so-called spot welding, the bars 31 and 32 were made of copper and had their opposite ends made the size of the welded spot desired. These copper bars were secured in the clamps by forcing up the movable jaws and securing them by tightening up the nuts on the bolts 13 and 14. Overlapped sheets of metal were then placed between the electrodes 31 and 32 and the clamps moved toward each other until the electrodes pressed upon the overlapping sheets on opposite sides. Current was then passed through the electrodes and overlapping sheets of metal from one clamp to the other, a welding heat was produced and then pressure was applied to force the heated metal of the plates together to form

a weld which was about the size of the ends of the electrodes 31 and 32. The electrodes were then withdrawn by separating the clamps and the operation repeated in as many spots as desired. Current is supplied to the clamps having jaws 8 and 12 by conductors 33 and 34 leading to one pole of the transformer while current is supplied to the other clamp by means of conductors 35 and 36 leading to the other pole of the transformer. The machine which I saw at the factory of the Warren Electric & Specialty Company in Warren, Ohio, in 1901, was the same as that shown in Exhibit "I", and was operated at that time to perform butt and spot welding in the manner as I have just described in connection with this Exhibit. I distinctly remember that at that time the space between the clamp arms 3 and 4 was not sufficiently deep to permit the sheets, to be welded together, to extend sufficiently low down when placed between the electrodes 31 and 32 when these electrodes were straight, and so we bent the ends of these electrodes upwardly so as to allow the sheets of metal to enter between the electrodes to a sufficient extent to place the weld at the spot desired. This machine was used as I have described for some years subsequent to 1901 but in the use of the machine it was found by the operator that after the arms 17 and 18 had been thrown to force the clamp jaws together they would reach their limit of movement in this respect and to all intents and purposes were secured to the arms 3 and 4, and it became the practice to move these arms 3 and 4 by these levers 17 and 18 in forcing the clamps together to effect the weld. The arms 23 and 24 fell into disuse, and being in the way were removed. I do not know just when this occurred but it followed in the natural course of use of the machine sometime after it had been built in 1901. In the original machine the base plate was made in two pieces 1 and 2 which were separated by a piece of fibre to insulate them which extended substantially the whole length of the base plate. It was found however, that the drip from the welds under the pieces 31 and 32 was caught by the fibre and sometimes established a connection between the metal plates 1 and 2 which would require the cleaning out of this drip to get good operation of the machine. This hot drip would also burn the fibre. The fibre piece was therefore cut out directly under the spot where the weld was made which afforded

a large clearance for the insertion of sheets to be welded and also prevented the accumulation of the drip. The machine was used in this condition by the Warren Electric and Specialty Company and their successors the Peerless Electric Company for electric welding up to about five years ago, when, in order to improve the insulating qualities of the machine, I placed the base plates (1 and 2) upon a plate of slate. Also the conductors 35 and 33 were omitted as it was found that the conductors 34 and 36 were ample to carry the necessary current. The machine was in this condition when I saw it last which was last December at the works of the National Electric Welding Company, in Warren, Ohio. These changes made as I have noted were minor details made with a view to simplifying the machine and making the insulation more efficient, and did not change the manner of operation or the work produced, the machine being substantially the same and operating in the same way and producing the same work as when it was originally built in 1901.

I have seen various makes of machines used for spot welding and butt welding and in every case the butt-welding machines could be as well used for so-called spot welding, it being merely a question of whether a large weld or a smaller weld is desired, and as to the securing of sheets together by welds in a number of separated spots this merely means that the making of a weld in one spot is duplicated a number of times.

EVRAH C. LIPPS.

Subscribed and sworn to before me this sixth day of October,  
A. D. 1913.

Bertram D. Connolly,

Notary Public, Wayne County, Michigan.

[Seal]

My commission expires December 9, 1916.

#### AGREEMENT.

This agreement made between the Warren Electric & Specialty Co. of Warren, Ohio, party of the first part and E. C. Lipps party of the second part, Witnesseth that whereas party of the second part is possessed of a process of making incandescent lamp filaments which are said to be superior to the kind now in use by party of the first part, therefore, party of the first part hereby agrees to employ party of the second part to make such filaments for the period of one year from March 2d, '98, and to pay party of the

second part \$1,000 payment to be made in twenty-six equal payments. Said party of the second part is to be provided with a suitable mixing room or laboratory in which to make said filaments and which room shall be entirely under his control and no one shall be permitted to enter it except by consent of the party of the second part except E. W. Gillmer, said party of the second part is to explain and does hereby agree to explain to E. W. Gillmer all formulaes and all manipulations required to properly make said filaments.

If at any time during the continuance of this contract said party of the second part should be discharged by party of the first part, and said party of the first part engage further in manufacturing these filaments according to processes divulged to E. W. Gillmer then party of the second part shall be entitled to receive from party of the first part \$500.

Said party of the second part agrees to manufacture strictly high grade filaments and should such filaments not be sufficiently good to enable party of the first part to use them the contract may be cancelled by party of the first part giving notice to the party of the second part of thirty days.

Party of the second part agrees to take into the room such assistance as are necessary to make filaments in such quantities as may be required by party of the first part.

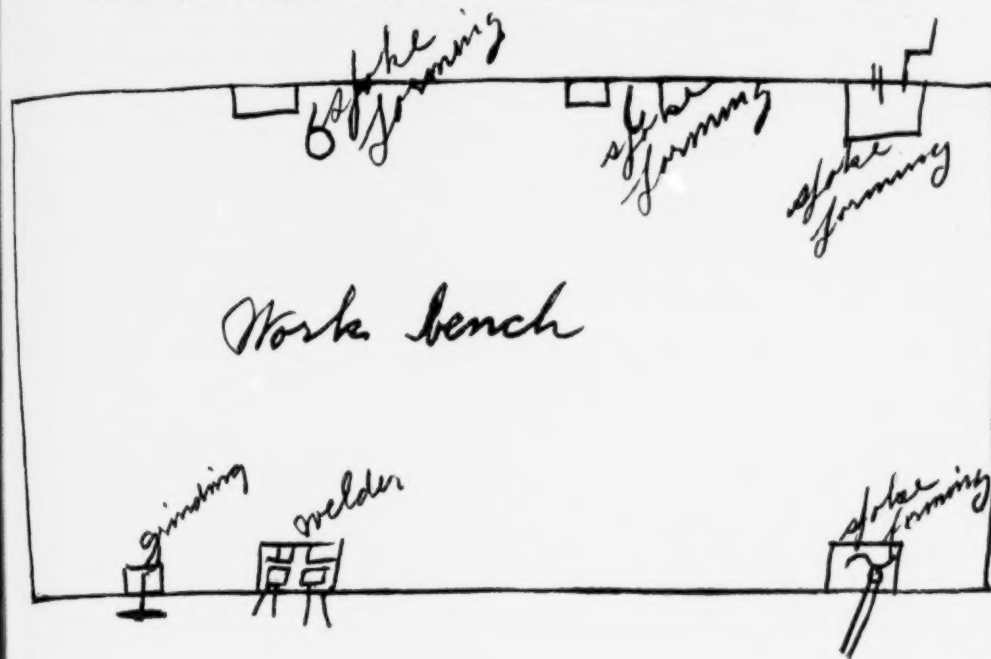
THE WARREN ELECTRIC & SPECIALTY CO.

Elmer W. Gillmer, Secy & Treas.

E. C. LIPPS.

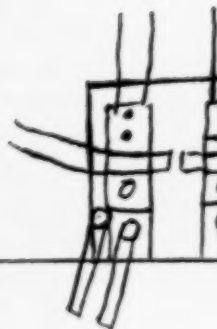
Mar. 2d, 1898.

PLAINTIFF'S EXHIBIT No. 31, BREWER SKETCH OF WORK BENCH.

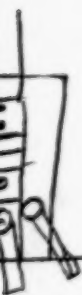




## PLAINTIFF'S EXHIBIT



T No. 32, BREWER SKETCH OF WELDING MACHINE.





**PLAINTIFF'S EXHIBIT No. 33.—AFFIDAVIT OF MESSRS.  
BROWN, PENDLETON, PFILE, BETCHEL, McCURDY, PILZ,  
WOLCOTT, WAKEFIELD, ESTABROOK, BEAN, LEWIS,  
MEENELY, BETTIKER AND ULP, OBTAINED BY MR. HOWE.**

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio

County of Trumbull ss

Mr. Milton W. Bechtel, being duly sworn, deposes and says as follows :

My name is Milton W. Bechtel ; I am 43 (today) years of age ; I reside at Warren, Ohio and am Secretary, Treasurer and General Manager of The Borden Company of Warren, Ohio.

The regular time record and pay-roll of The Borden Company show that Alfred Ulp entered the employ of The Borden Company on July 6th, 1901, and remained in the employ of that company until April 3rd, 1903.

MILTON W. BECHTEL

Subscribed and sworn to before me this 7th day of October, nineteen hundred and thirteen.

Harry R. Williams

[SEAL]

Notary Public.

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull.

Austin C. Pendleton, being duly sworn, deposes and says as follows :

My name is Austin C. Pendleton. I am 32 years of age and reside in Warren, Ohio. I am at present General Manager of the Trumbull Mfg. Co., engaged in business as general machinists. I have been employed by this Company since prior to 1901, and I distinctly recollect that we moved into our present quarters in the summer of 1901, on account of a fire which had occurred in the buildings which we formerly occupied. I further recollect that Evrah C. Lipps was employed by the Trumbull Mfg. Co. as a machinist in the summer of 1901 at about the time we moved into our present quarters.

I have made a search through the records of the Company but find that all records of employees of the Company, such as time books, checks and the like prior to 1902 have been destroyed. I find, however, from the books of the Company that four months rent of the old building was paid by the Company in June, 1901. This was probably payment of rent up to July 1st, 1901. This is the last entry of rent which appears in our records for this old building and corroborates my recollection that we moved to our present quarters in the summer of 1901.

AUSTIN C. PENDLETON.

Subscribed and sworn to before me this 10th day of October,  
A. D. 1913.

C. E. Stephens

[SEAL]

Notary Public.

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull

Oscar C. Pilz, being duly sworn, deposes and says as follows:

My name is Oscar C. Pilz, am 30 years of age and reside in Warren, Ohio. I am employed by the Ohio Division of the National Electric Lamp Association, of the General Electric Company as a machinist. I distinctly recall of working in a rolling mill in War-

ren, Ohio, when Evrah C. Lipps asked me to go to Cleveland, Ohio, to aid him in the manufacture of electric fans.

This I did, and recall distinctly of being with Mr. Lipps several weeks in the summer time in Cleveland, Ohio, on this fan motor work. I should say that this was about thirteen years ago, but this is purely from recollection and I have no means at hand of verifying the date. On my return from Cleveland, Ohio, I entered the employ of the National Electric Lamp Association at Warren, Ohio.

OSCAR C. PILZ.

Subscribed and sworn to before me this 10th day of October,  
A. D. 1913.

C. E. Stephens

[SEAL]

Notary Public.

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull.

Robert J. Meenely, being duly sworn, deposes and says as follows:—

My name is Robert J. Meenely. I am 39 years of age and reside in Warren, Ohio. I am employed by the Warren Iron and Steel Company at Warren, Ohio. I remember clearly being employed by the Warren Electric and Specialty Company at Warren, Ohio, prior to the starting of the Peerless Electric Company, and prior to the building of the brick buildings which were built for the Peerless Company when it was started. I remember distinctly that the company was at that time the Warren Electric and Specialty Company, and not the Peerless Electric Company, which came along afterwards.

My work with the Warren Electric and Specialty Company at that time was on fans, in connection with which I bent up the stock to form the fan guards which were welded on an electric welding ma-

chine in the works of the company, and I did the welding of the ends of the fan guards together myself sometimes during that period. I do not recall having seen any other welding done on this machine except the welding of the ends of the fan guard rings together, but my work did not require me to make any other kinds of welds. As I was not at the machine all of the time and was off two or three months, and furthermore as I was not interested except to do my regular work upon it, it is entirely possible that others may have made other kinds of welds upon the machine than I have referred to. I recall that in using the machine to make fan guard welds, the rings were secured in the clamps by means of a pair of handles. The clamps were then moved towards each other by another pair of handles until the ends to be welded came together. The current was then turned on and after the stock had reached a welding heat the clamps were forced together further to force the hot metal together to make the welds and the current was cut off.

ROBERT J. MEENELY.

Subscribed and sworn before me this 8th day of November, A. D. 1913.

Geo. T. Hecklinger,

Notary Public.

In the United States District Court. District of Massachusetts.  
In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio

County of Trumbull, ss.

John S. Gilder, being duly sworn, deposes and says as follows:

My name is John S. Gilder. I am 38 years of age and reside in Warren, Ohio. I am at present employed by the Enterprise Electric Company of Warren, Ohio, as a transformer assembler.

Early in the year 1900 I came from the home of my parents in Kinsman, Ohio, and entered the employ of the Warren Electric and Specialty Co. in Warren, Ohio. This was in the early part of the

year 1900, in January or February, because I remember that it was cold and wintry.

When I first entered the employ of the Warren Electric & Specialty Co. in 1900, the Company was making its fan guards of brass. The rings of these guards at first had their ends secured together by inserting them in a sleeve and then securing them with solder.

Later it was the practice to dowel the ends of the rings together and then sweat them.

The next season, or the one after, that is in the year 1901 or 1902, the manufacture of iron fan guards was begun by the Company. At first they tried brazing the ends of the iron rings for the guards together, but that was not satisfactory and the welding of the iron guard rings by electricity was begun.

This electric welding was started either the same season that the use of iron fan guards was begun, that is in 1901 or 1902, or it may have been the next season after that. I have given these dates entirely from recollection and have no papers or memoranda by which I can verify them.

I recall in a general way seeing the electric welding machine which was used for welding the iron fan guards at the time I have mentioned. I recall this machine in a general way but could not go into details regarding it. I recall that there were two short handles for pushing the clamp jaws together to secure the work in them, and there were two larger handles for pushing the clamps toward each other to bring the stock together to weld it. My work at the time was that of general utility man. I helped form the pieces for the guards in the shop and sometimes would assist in the welding. The only kind of welding which I remember seeing done on the machine at that time was the welding together of the ends of the stock to make the fan guard rings. It was only occasionally, however, that I was in a position to know what kind of work was being done on the machine so that other kinds of work and characters of welds may have been made which I knew nothing about.

I have, on October 7th, 1913, examined a welding machine at the works of the National Electric Welder Co. at Warren, Ohio, and while I did not have sufficient to do with the machine so that all details were impressed on my mind, this appears to be the same



machine that I saw used at the factory of the Warren Electric & Specialty Co. for welding the rings of iron guards as I have described.

JOHN S. GILDER.

Subscribed and sworn to before me this 10th day of October,  
A. D. 1913.

C. E. Stevens,

[SEAL]

Notary Public.

In the United States District Court. District of Massachusetts.  
In Equity

Thomson Electric Welder Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull.

Walter T. Wakefield, being duly sworn, deposes and says as follows: —

My name is Walter T. Wakefield, am 45 years of age and reside in Warren, Ohio. I am employed by the National Biscuit Company as their local representative.

I find on referring to my diary that in the years 1901 and 1902 I was employed by the Warren Electric and Specialty Company in Warren, Ohio. This accords with my recollection. I was employed by the Warren Electric and Specialty Company in charge of their japanning and lacquering department. I remember that at this time the cheaper grade of fans had iron guards, and that the ends of the guard rings were welded together. I recall that this was done at the time we moved from the building which we had formerly occupied, into the basement of another building which is now known as the buffing and japanning room of the Peerless Electric Company. This was in the year 1902 as nearly as I can recollect.

I remember at this time we moved into the basement of the new building, that the guards which I handled were electrically welded. We moved into the basement just after the building in which it was located was finished, and this was in the year 1902 as nearly as I can recollect. I recall that the basement we moved into was

referred to among the employees as "down in the hole" and it was often said that I "had moved down into the hole".

The electric welding on the fan guards I had at this time was done on an electric welding machine in the shop of the Warren Electric and Specialty Company (later the Peerless Company). I do not recall anything about this welder, as I was not brought into contact with it in any way and knew of its being there simply by the fact that I understood the welder was there and I had the electrically welded guards to work on.

WALTER T. WAKEFIELD.

Subscribed and sworn to before me on this 10th day of October,  
A. D. 1913.

C. E. Stevens,

[SEAL]

Notary Public.

In the United States District Court District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull.

David R. Estabrook, being duly sworn, deposes and says as follows:—

My name is David R. Estabrook, am 37 years of age, and reside in Warren, Ohio. I am employed by the Peerless Electric Company as superintendent. I started in the employ of the Warren Electric and Specialty Company, in their lamp factory in the year 1897 and have been in the employ of that company and its successors the Peerless Electric Company ever since.

In the years 1898-1899, the Warren Electric and Specialty Company started in the fan motor business. I recollect that this was during the summer of the Spanish-American War. The company a few years after started in the manufacture of a cheaper grade of fans having guards of iron and there was an electric welding machine in the factory by which the ends of the rings of the guards were welded together. As nearly as I can recollect this electric

welding machine and the welding of the iron fan guards was prior to the forming of the Peerless Electric Company, which was in the year 1902. I never knew of any welding done on this machine other than the welding of the fan guards which I have referred to, but it was only occasionally that I saw the machine and other welding might have been done on it without my knowledge. Sometimes when occasion required it, I might have performed some welding on the machine, but I do not recall the machine except in a very general way as I did not have any particular interest in it except to get the fan guard rings secured together.

DAVID R. ESTABROOK.

Subscribed and sworn to before me this 10th day of October, A. D. 1913.

Geo. B. Sawyer,

Notary Public.

[Seal]

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull.

Robert W. Bean, being duly sworn, deposes and says as follows: My name is Robert W. Bean. I am 38 years of age and reside in Warren, Ohio. I am employed by the Peerless Electric Co. as a machinist. In October 1902, I went into the employ of the Sterling Electric Co. when it was started. The business of this company was manufacturing incandescent lamps. Prior to going to this Company I was employed by the Warren Electric & Specialty Co. During this employment with the Warren Electric & Specialty Co., I remember seeing an electric welding machine which had been designed by Mr. Fred P. McBerty, and which was in the works of the Company. I recall that this machine was used at that time for welding the iron rings for fan guards, and I remember at that time of making a set of forms for welding twelve inch by sixteen inch rings which were used in these guards. I also remember turning

up the copper jaws on the outside for the welding machine. All this took place prior to my going to the Sterling Electric Co. in October, 1912.

This electric welding machine was made about the time I was married, on Sept. 30th, 1900. It was shortly after this that the welder was made, it having been built in the latter part of 1900 or the first part of 1901. I entered the employ of the Warren Electric & Specialty Co., on Nov. 22nd, 1899. I do not recall any welding done upon this machine except the fan guard welding I have referred to, but the operation of the machine was not a part of my work, I having simply made some of the parts for it and helped construct the machine, so that it is entirely possible that other kinds of welding may have been performed which I knew nothing about.

Within the last six months I have examined an electric welding machine at the works of the National Electric Welder Co. at Warren, Ohio, and while this may differ in slight details, so far as I can see, it is the same as the machine which was built and operated in the works of the Warren Electric & Specialty Co., Warren, Ohio, in 1900 or 1901, as I have stated.

ROBERT W. BEAN

Subscribed and sworn to before me this 10th day of October, A. D. 1913.

Geo. B. Sawyer

[Seal]

Notary Public.

In the United States District Court. District of Massachusetts.

In Equity.

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio.

County of Trumbull.

Newton A. Wolcott, being duly sworn, deposes and says as follows:—

My name is Newton A. Wolcott. I am 38 years of age and reside in Warren, Ohio, and am General Manager of the Packard Elec

tric Company of Warren, Ohio. The business of this company is the manufacture of electrical apparatus. I graduated from Lehigh University in the year 1903, and in my vacation of the previous year, that is in the summer of 1902, I was employed in the shops of the Peerless Electric Company at Warren, Ohio.

I distinctly remember seeing at that time an electric welding machine, which I understood was devised by Mr. Fred P. McBerty and which machine was employed in welding together the ends of the iron fan guard rings of the Peerless Co. I do not recall having seen any other work performed on this electric welding machine, but it might easily have been done without my knowledge as my work did not bring me in contact with the electric welding and I saw it only occasionally. I have, however, a clear recollection of the appearance of the electric welding machine at the Peerless Company's plant in 1902. I have recently, on October 7th, 1913, inspected an electric welding machine at the works of the National Electric Welder Co., Warren, Ohio, and this machine operates in the same way and so far as I can see appears to be the same machine that was at the Peerless Co's works in 1902, although it was a good many years ago that I saw it at the works of the Peerless Company and the machine I saw on October 7th last, may differ in some small details from the machine I saw in 1902.

NEWTON A. WOLCOTT.

Subscribed and sworn to before me this 18th day of October,  
A. D. 1913.

Chas. P. Nye,

Notary Public.

[SEAL]

In the United States District Court. District of Massachusetts.  
In Equity.

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull,

Edward Bettiker, being duly sworn, deposes and says as follows: —

My name is Edward Bettiker, am 46 years of age and reside in Warren, Ohio, and am employed by the Peerless Electric Company at Warren, Ohio, as a machinist. On December 26th, 1900, I entered the employ of the Warren Electric and Specialty Company at Warren, Ohio, at that time leaving the Winfield Manufacturing Company. Within a few months after I entered the employ of the Warren Electric and Specialty Company, that is, in the early part of 1901, I recall making four copper forgings to construct the jaws for holding the stock in an electric welding machine, which had been devised by Mr. Fred P. McBerty. My work at the time was operating a press and as the press work was well ahead I recall striking for the blacksmith on this work. The blacksmith was Mr. Iles who is now dead. Mr. Edward Craft superintended the building of the welding machine, and Robert Bean had something to do with the construction of the machine. After the welding machine was completed it was taken up stairs and I had little to do with it afterwards but remember seeing the fan guard rings welded upon it.

I recall that the welder was built in the old frame building of the Warren Electric and Specialty Company before the brick buildings which were after put up by the Peerless Company (the successors of the Warren Electric and Specialty Company) were built; and I saw the fan guard rings welded with this machine in the old frame building and before the building of the brick buildings.

I have within the last week examined a welding machine at the works of the National Electric Welder Company in Warren, Ohio, and while it may differ in some slight details I believe that this is the same machine as that which was built and welded fan guards in 1901, as I have referred to.

EDWARD BETTIKER.

Subscribed and sworn to before me this 10th day of October,  
A. D. 1913.

Geo. B. Sawyer,

Notary Public.

[SEAL]

In the United States District Court. District of Massachusetts.  
In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Michigan,

County of Wayne.

Alfred Ulp, being duly sworn, deposes and says as follows:

My name is Alfred Ulp. I am 43 years of age and reside in Detroit, Michigan. I am employed by the Packard Motor Car Company as a machinist.

I came to Detroit and entered the employ of the Packard Motor Car Company, October, 1903. For about two years previous to going with the Packard Company, in Detroit, I was employed by the Borden Company in the old S. W. Parks Building in Warren, Ohio. I left the Packard Automobile Company, then known as the Ohio Automobile Company, to go with the Borden Company, having entered the employ of this Ohio Automobile Company (Packard Company) in February, 1901. I recall that I left the employ of the Packard Company in the fall of 1901. Previous to entering the employ of the Ohio Automobile Company (Packard Company) in February, 1901, I had been working for the Warren Electric and Specialty Company in Warren, Ohio, for a year or more. I recall distinctly of seeing in the factory of the Warren Electric and Specialty Company, and before I went with the Packard Company in 1901, an electric welding machine which was employed for welding ends of the stock forming the fan guard rings together.

I was employed in the machine shop but sometimes went where the welding machine was and recall seeing welding of the character I have described done on it. It might be however that welds of other character were done on the machine as I was not directly concerned with this electric welding and only saw it incidentally as I might be passing, or as I might be called to assist someone in making welds at odd times.

ALFRED C. ULP.

Subscribed and sworn to before me this 22nd day of October,  
A. D. 1913.

Archie W. Reid

[Seal]

Notary Public.

My commission expires Oct. 15th, 1916.

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull.

Charles B. McCurdy being duly sworn, deposes and says as follows:

My name is Charles B. McCurdy. I reside in Warren, Ohio, and I am superintendent of the Enterprise Electric Co. which is engaged in the manufacture of electric transformers.

I have examined the transformer data book in which is entered the date of construction, the date of winding and the date of shipment, and the consignee of each transformer made and shipped by the Warren Electric & Specialty Co., their successor, the Peerless Electric Co., and their successor the Enterprise Electric Co., all of Warren, Ohio, from the date of the first shipment on August 3rd, 1900 to Oct. 6th, 1906. This book shows that a 2 1/2 K. W. transformer was shipped to the Pneumatic Wheel Co. at Freehold, New Jersey on June 27th, 1900, that this transformer was returned and sent to the fan motor department of the Peerless Electric Co. on January 20th, 1901, that a 12-1/2 K. W. transformer was shipped to the Pneumatic Wheel Co. at Freehold, New Jersey on Sept. 27th, 1900 and was returned on March 18th, 1901, and that a 25 K. W. transformer was shipped to the Pneumatic Wheel Co. at Freehold, N. J. on Sept. 27th, 1900.

These are the only records of any transformers shipped to Freehold, N. J., and as I stated above, the records referred to include all of the transformers shipped by the Companies mentioned between the dates mentioned.

CHAS. B. MCCURDY.



Subscribed and sworn before me this 10th day of October A. D.  
1913.

C. E. Stephens

[Seal]

Notary Public.

In the United States District Court. District of Massachusetts.  
In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull,

Rolland F. Pfile being duly sworn, deposes and says as follows:

My name is Rolland F. Pfile. My age is 36, I reside at Warren, Ohio, and I have charge of the lines and outside work of the Trumbull Public Service Co., at Warren, O. I came to Warren, Ohio from Ravenna, Ohio seven years ago this fall and entered the employ of the Peerless Electric Company at Warren, O. I was never in the employ of the Warren Electric & Specialty Co., nor was I ever in the works of that Company or had anything to do with it.

ROLLAND F. PFILE.

Subscribed and sworn to before me this 10th day of October  
A. D. 1913.

C. E. Stephens,

[Seal]

Notary Public.

In the United States District Court District of Massachusetts.  
In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Ohio,

County of Trumbull.

Alton J. Lewis, duly sworn, deposes and says as follows:

My name is Alton J. Lewis, I am 44 years of age and I reside in Warren, Ohio. I entered the employ of the Warren Electric

and Specialty Company, Warren, Ohio, as a Plater and Buffer about the year 1900 and have been employed by them and their successor, the Peerless Electric Company, in this same class of work ever since that time. Shortly after I entered the employ of this company I saw an electric welding machine which was devised by Mr. Fred P. McBerty, and this machine was used for welding together the ends of the rings used in fan guard manufacture by this company. I recall that this welder and the welding was in the old frame building occupied by the Warren Electric and Specialty Company prior to the building of the brick buildings which were built by the Peerless Electric Company when they succeeded the former company.

I further recall that this welder and welding done upon it existed prior to the year 1902 for the reason that these welded fan guards were dipped and japanned by Walter Wakefield at the back of the old building before the japanning and dipping department was moved into the basement of the new building, and this department was moved into the basement of the new building in the year 1902. This I recollect distinctly as the moving into the basement was referred to as "moving into the hole". I recall that Walter Wakefield was in charge of the japanning and dipping department and wrote on the wall "moved into the hole 1902".

I do not recall any further welding done on this machine at that time than that I have already referred to as my work did not bring me in contact with this matter and I merely knew of this welding from occasional observation and general knowledge of the work going on in the factory. Other welding than that I have mentioned could have easily been carried on without my knowledge.

ALTON J. LEWIS.

Subscribed and sworn before me this 10th day of October, A. D. 1913.

Geo. B. Sawyer,

[Seal]

Notary Public.

In the United States District Court. District of Massachusetts.

In Equity

Thomson Electric Welding Company, et al.

vs.

Barney & Berry, Incorporated.

On Harmatta Patent No. 1,046,066.

AFFIDAVIT.

State of Michigan,

County of Wayne, ss.

Frank G. Brown being duly sworn, deposes and says as follows:

My name is Frank G. Brown, age 40, and I reside at 237 Woodland Avenue, in the city of Detroit, State of Michigan. I am, at present employed by E. J. Kruce & Company, 322 Harper Avenue, Detroit, Michigan. The business of this company is that of tool makers and machinists, and my position with them is that of manager. I have been in my present position for approximately the two years last past.

I was formerly employed by the Warren Electric & Specialty Company, in their factory at Warren, Ohio, as a machinist. At the time of my employment by this company their business was the manufacture of electric fan motors, transformers and incandescent lamps. I first entered the employ of the Warren Electric & Specialty Company in May, 1899 and remained there until November, 1899. From November, 1899, until February, 1900 I was employed a portion of the time in the Tube Works at Warren, Ohio. In February 1900 I again entered the employ of the Warren Electric & Specialty Company where I remained until April 1900, when I left and took a position with the Packard Motor Car Company, at Warren. After entering the employ of the Packard Motor Car Company at Warren in April 1900, I remained with that company until July 1903. I then went to the Standard Engineering Company of Elwood City, Pa., where I stayed until January 1904. I then went with the Peerless Electric Company at Warren, O., where I stayed until April 1904, and then went into the factory of the National Electric Lamp Association at Warren, O., and remained there until July 1906. I then went into the employ of the Packard Motor Car Company, in Detroit, Michigan,

where I stayed until April 1911 and then took the position which I now hold. While I was still with the Packard Company in April 1901 I received word from Mr. Fred B. McBerty of the Warren Electric & Specialty Company requesting that I call on him at an early date. I called on Mr. McBerty at the works of the Warren Electric & Specialty Company at Warren, Ohio, on the following Sunday, which was a date previous to May 6th, 1901. At this time that I called on Mr. McBerty in April or May 1901, he requested me to return to the employ of the Warren Electric & Specialty Company offering me thirty cents per hour. I advised him that the machinists at the Packard Works had requested a reduction of time to nine hours per day and that while Mr. McBerty offered me more than I was getting at Packard's I did not think it would pay me to make the change, particularly if the reduction to nine hours per day went into effect, which I believed would be the case. The demand by the machinists for the nine hour day, which had been presented to the officials of the Packard Company, embodied the request that the nine hour day go into effect on May 20th, 1901. The Packard Company granted the nine hour day, and it went into effect on May 6th, 1901. I, therefore, know that the visit to Mr. McBerty was prior to May 6th, 1901, as it was prior to the going into effect of the nine hour day at the Packard Works.

Upon this visit to Mr. McBerty prior to May 6th, 1901, Mr. McBerty showed to me and explained an electric welding machine which was in the factory of the Warren Electric & Specialty Company. This welding machine was adapted for use either as a butt welder or a spot welder. By butt weld, I mean butting the ends of two pieces to be welded together and welding them together over the whole of their abutting surfaces. By spot welding I mean welding two thin sheets of metal together by overlapping them and welding them together in one or more spots, a welded spot being only a small portion of the overlapping area of the plates. To accomplish this butt welding, Mr. McBerty explained that the two pieces of stock to be welded together were placed in the welding clamps which were slidable toward and away from each other. The clamps were then moved toward each other so that the ends of the stock butted together. Current was then turned on and after

the stock had become heated at the joint, the two pieces were pressed together and the weld formed. To spot weld, instead of placing the stock to be welded in the clamps, a stiff copper conductor was placed in each of the butt welding jaws or chucks, these pieces extending toward each other, but having a small space between them — about one eighth of an inch. The opposing ends of these two copper conductors were flat and were reduced to an area less than the cross section of the main part of the conductor, the opposing faces being about an eighth of inch in diameter. To effect the spot weld two sheets of steel were lapped over and the overlapping portion placed between the electrodes formed at the ends of the copper conductors held in the butt welding clamps. The clamps were then moved toward each other as in the butt welding operation, which caused the electrodes to press toward each other upon opposite sides of the over lapped steel sheets. Current was then turned on in the clamps by closing the switch supplying the current to the welding transformer. Current would then pass through the clamps, copper conductors constituting electrodes, and the steel plates. The spot on the plates between the electrodes would then be heated to a welding temperature, and the weld was completed by forcing the electrodes towards each other thereby applying pressure at the spot where the weld was made, the spot being approximately the size of the face of the electrode — that is, about an eighth of an inch. The construction, arrangement and operation of the welding machine was fully explained and demonstrated to me by Mr. McBerty as I have described, on my visit to him in April or May, 1901, but no actual weld was made at that time as it was Sunday and no electric current was available as the factory of the Warren Electric & Specialty Company had its own electric plant which was shut down on holidays.

I recall distinctly that the welding machine had two pairs of arms, one pair for closing the clamps holding the work and the other pair for moving the clamps towards each other to press the pieces together in making the weld. In the butt welding the stock is secured in the clamps and forced together end to end by pushing the clamps towards each other as I have described. In the spot welding, the copper conductors forming the electrodes are placed

in the clamps and are forced against the plates to be welded by moving the clamps toward each other.

The sketch in the photographic print attached hereto and marked Exhibit A is a correct showing of the welding machine shown to me by Mr. McBerty in April or May 1901. My attention was particularly drawn to the welding apparatus and its work as Mr. McBerty and I were very friendly and he took a great deal of interest in showing it to me. Mr. McBerty had just built the machine and was very enthusiastic over using it in this Company's work, and I was interested as I had never seen electric welding before.

At the time I visited Mr. McBerty at the factory of the Warren Electric & Specialty Company in April or May, 1901, he showed me specimens of spot welding which had been done on the machine which I saw and referred to above. I particularly remember his showing me steel fan blades for electric fans which were welded to the arms of the fan centers by spot welds which took the place of the usual rivets for securing the blades. Attached hereto is a fan blade secured to an arm cut from a fan center. This is marked Exhibit B. This fan blade is welded to the arm by three spot welds and if it is not one of the identical fan blades welded to a center arm which was shown to me by Mr. McBerty when I visited him in April or May, 1901, it is precisely the same. I identify this Exhibit B as being the same as the device shown me by Mr. McBerty at the time mentioned as it appears in all respects to be the same and particularly the fan blade and arm have holes punched in them for rivets which are really unnecessary when the blade is welded to the arm. I recall distinctly that at the time Mr. McBerty stated that the fan blade and arm which were welded together were ones that had been punched for rivets in accordance with the practice of the company which had always employed rivets for this purpose, and their stock was prepared for them. Mr. McBerty told me at that time that he thought this spot welding would be of use in producing a cheaper fan which his company was putting out, and in which steel fan blades and centers were used in place of the more expensive brass blades and centers, and I clearly recollect saying that the parts were well secured together and of thinking that the welds were strong, reliable and practical. I learned later

that the securing of the fan blades to the center by spot welding was not adopted by the Warren Company for the reason that Mr. E. W. Gillmer the then Secretary, Treasurer and General Manager of the Warren Company, but who is now dead, would not sanction it. The reasons for this, as I understand them, were that the stock of fan blades and centers of the company had already been punched for rivets, and the spot welding of the blades to the centers would leave the rivet holes which did not give a good appearance. It was further thought inadvisable to lay in a new stock of unpunched centers and blades as this would practically double the stock of these parts which it would be necessary to carry. Since that time I have heard Mr. McBerty refer to the use of spot welding and in particular I recall that he purchased the transformer interests of the Peerless Electric Company, and at that time said he considered strongly the construction of spot and butt welders in connection with the manufacture of transformers. Since the time of my visit to Mr. McBerty in April or May, 1901, I have seen the machine which he then showed me in operation in actual welding work. I particularly remember that in the year 1906 just before I went with the Packard Company in Detroit, I saw the machine in use at the plant of the Peerless Company, in Warren, Ohio, successors of the Warren Electric & Specialty Company. It was being used in the regular work of the company for butt welding together the ends of the rings of the fan guards in the regular commercial fans of the Company. I also have seen this machine used for spot welding as I have described above and recall seeing this while I was employed in Warren after I returned from Elwood City in 1904 and before I went with the Packard Company in Detroit in 1906. This spot welding was not done on any commercial product of the company for as I understood it there was no commercial product of the company to which it was adapted as a commercial proposition. This spot welding which I saw done was done by the people interested in the machine to show that this manner of securing parts together was thoroughly successful and practical when any construction to which it was adapted commercially should arise in the work of the company. I have not seen this machine in operation since 1906 as I severed my connection with the Peerless Company in July, 1906.

Although my trade is that of a machinist I have been employed

in factories where electric lamps, transformers, fan motors and other electrical apparatus were manufactured for a good many years so I have been brought in contact with electrical apparatus to a large extent, and I understood clearly the operation of the machine in electric butt and spot welding as described to me by Mr. McBerty and as referred to by me above.

I further am able to fix the time when I called on Mr. McBerty and saw and had explained his welding machine for butt and spot welding as early in the year 1901 from the fact that this visit occurred while a demand was being made by the men of the Packard Company for a nine hour day, and at this time I was a member of the union known as the International Association of Machinists and was regularly paying my dues. My due books in this Union, which two due books I hereto attach as Exhibit C, show that my last dues were paid on September 6th, 1901, these being my August dues.

I further remember there was a labor disturbance at the Packard Works beginning in October, 1901, the same fall that I dropped out of the machinists union. This trouble was settled about the first of December that year and my visit to Mr. McBerty at which he demonstrated this welding machine, as I have referred to, was in the spring before this labor disturbance occurred. I further recollect that the time of my visit to Mr. McBerty when he explained his welding machine to me, as I have referred to above, was at a time that I was building a house on Atlantic Street, in Warren, O. I moved into this house in June, 1901. Before the house which I was building was ready for me, I was obliged to move out of the house in which I had been living, and took temporary rooms until such time as my house should be ready for me and I recall that it was during my occupancy of these temporary rooms that I visited Mr. McBerty and saw the welding machine and that the nine hour day went into effect at the Packard Works, as I have referred to above.

FRANK G. BROWN

Subscribed and sworn before to me this 6th day of October,  
A. D. 1913.

Bertram D. Connolly

[Seal]

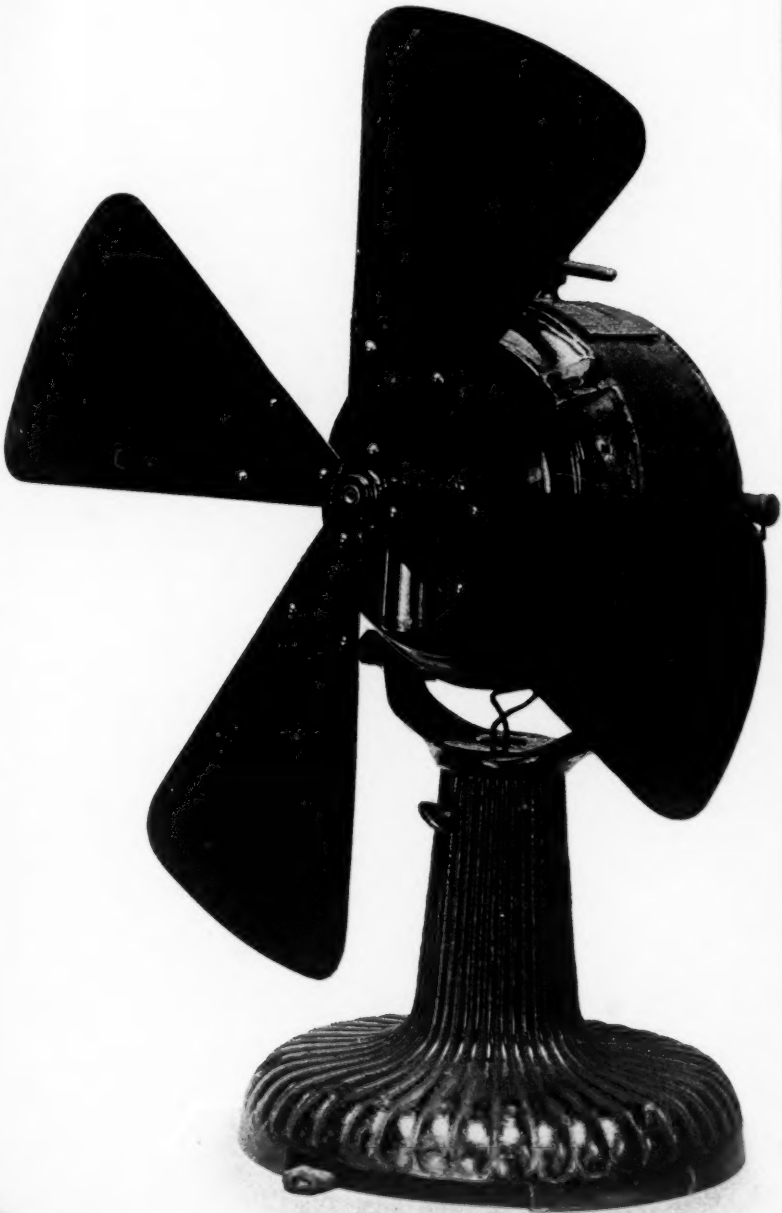
Notary Public Wayne County, Michigan

My commission expires December 9, 1916.



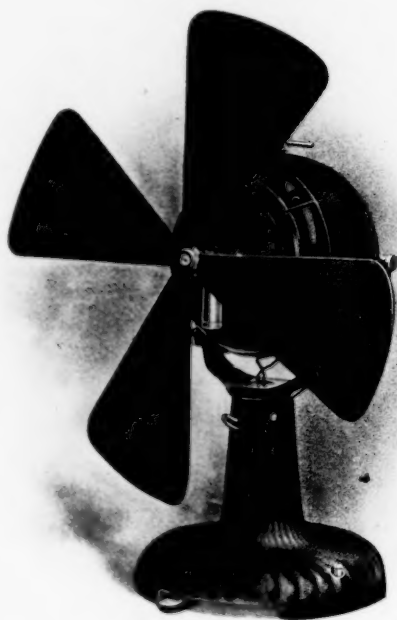


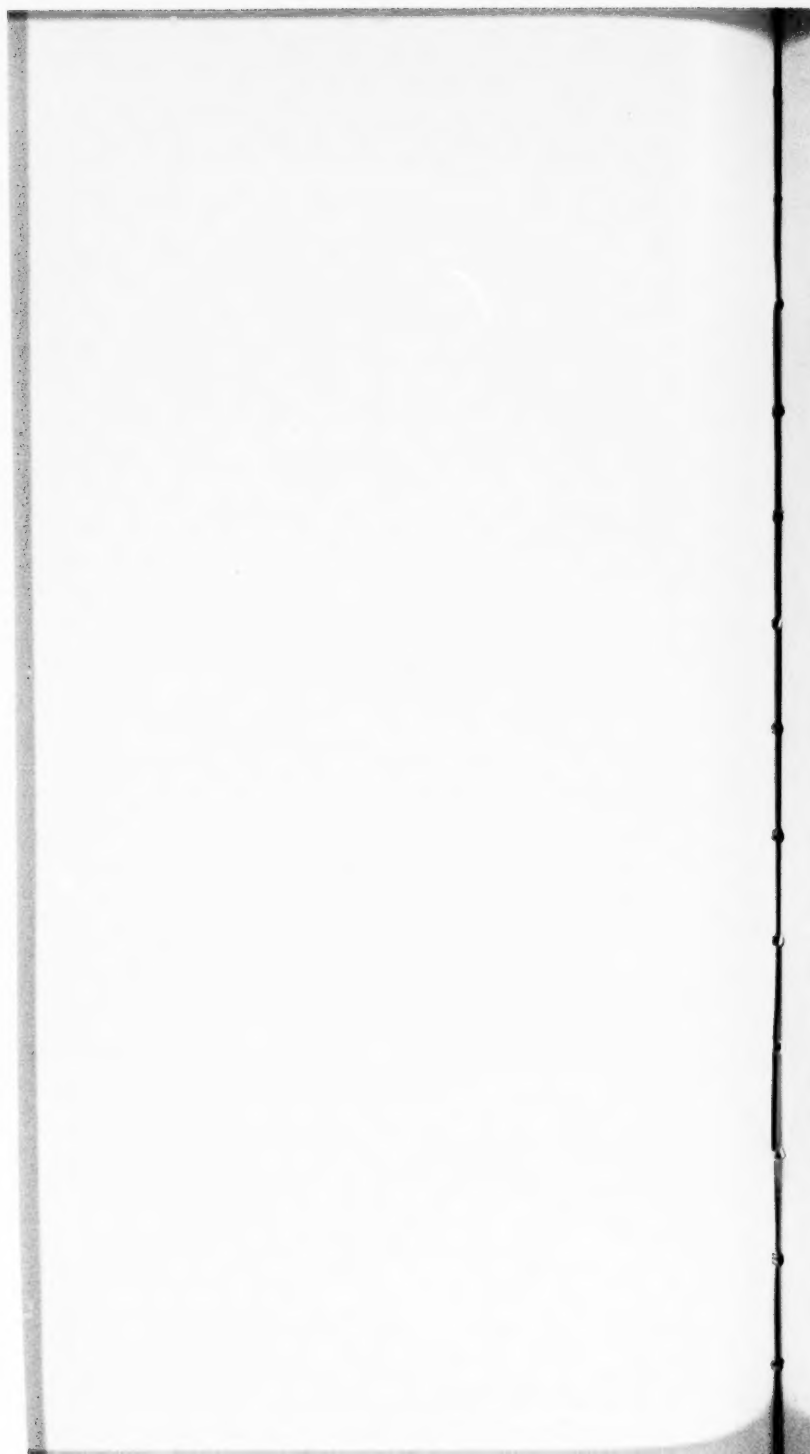
PLAINTIFF'S EXHIBIT No. 34.



**4  
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PLAINTIFF'S EXHIBIT No. 37.





IN THE  
**District Court of the United States**

FOR THE EASTERN DISTRICT OF MICHIGAN.

SOUTHERN DIVISION.

IN EQUITY.

ON HARMATTA PATENT NO. 1,046,066.

THOMSON SPOT WELDER COMPANY, Plaintiff,

*vs.*

FORD MOTOR COMPANY, Defendant.

AMENDED ANSWER.

The Amended Answer of FORD MOTOR COMPANY, defendant to the Bill of Complaint of THOMSON SPOT WELDER COMPANY, plaintiff:

This defendant answering says:

1. Defendant has no knowledge as to the citizenship and residence of the plaintiff, nor as to the incorporation of the plaintiff, as in the bill of complaint alleged, and leaves plaintiff to make such proof thereof as it may be advised. Defendant admits that it is a corporation, created and existing under the laws of the State of Michigan and that it is a citizen and inhabitant of said State. Defendant admits that this is a suit in Equity arising under the patent laws of the United States.

2. Defendant admits the issue of letters patent of the United States, No. 1,046,066, dated December 3, 1912, to Thomson Electric Welding Company, as the assignee of Johann Harmatta, but denies all the other allegations in Paragraph 2 of the bill of complaint, and leaves the plaintiff to make such proof thereof as it may be advised.

3. Defendant is not informed, save by the bill of complaint, whether or not the plaintiff has any such rights or interests as are set forth in Paragraph 3 of said bill and therefore denies all of the allegations of said Paragraph 3, and leaves the plaintiff to make such proof thereof as it may be advised.

4. Defendant denies that it has made, used or sold any articles covered by said letters patent No. 1,046,066 or that it has practiced the process set forth and claimed in said letters patent, in this judicial district or elsewhere, and denies that it has in any respect infringed said letters patent or any rights of the plaintiff therein, and denies that it has in any way damaged the plaintiff.

5. Defendants, upon information and belief, denies that the

Amended Answer.

Thomson Electric Welding Company, of Lynn, Massachusetts, at  
Lynn and elsewhere in the State of Massachusetts.

Sebastian Z. DeFerranti, of Hampstead, London, N.W., England,  
said Hampstead and elsewhere in the Kingdom of Great Britain.

(d) Because, for more than two years prior to the application of  
said Johann Harmatta for said letters patent No. 1,046,066,  
said invention or improvements claimed in and covered by said  
letters patent were in public use and on sale in the United States, by  
the following named persons, or concerns, at the following named  
places, viz:

Fred P. McBerty, of and at Warren, Ohio.

Warren Electric & Specialty Company, of and at Warren, Ohio.

Central Oil & Gas Stove Co., of and at Gardner, Massachusetts.

Elihu Thomson, of and at Lynn, Massachusetts.

Thomson Electric Welding Company, of and at Lynn, Massa-  
chusetts.

William Robinson, of and at Boston, Massachusetts, and at  
Brooklyn, New York.

Adolph Rietzel, of and at Lynn, Massachusetts.

(e) Because, the said Johann Harmatta was not the original,  
true and first inventor of the inventions or improvements set forth  
and claimed in said letters patent No. 1,046,066, but that said let-  
ters patent were surreptitiously and unjustly obtained for that  
which was in fact invented by another, to-wit, by Sebastian Z.  
DeFerranti, of Hampstead, London, N.W., England, who was  
exercising reasonable diligence in adapting and perfecting the same.

(f) Because, the subject matter set forth and claimed in said  
letters patent No. 1,046,066 was not set out in the application for  
said letters patent No. 1,046,066, as filed, as the invention of said  
Johann Harmatta and was not covered by the oath of said Johann  
Harmatta to said application, as required by the Statutes of the  
United States and the Rules of Practice of the United States Patent  
Office, made pursuant thereto, in such case made and provided,  
that such subject matter was inserted by amendment to said applica-  
tion, without the authority or sanction of said Harmatta, and with-  
out his oath as required by said Statutes and Rules.

(g) Because, of the abandonment to the public of the subject  
matter of said letters patent No. 1,046,066 by reason of the delay of  
the owner of the application for said letters patent to assert claim  
on such subject matter until more than a year after knowledge of  
the issue and publication of letters patent No. 928,701, granted  
July 20, 1909, to the predecessor in title of the plaintiff, Thomson  
Electric Welding Company, as the assignee of Adolph F. Rietzel;  
and defendant avers that the plaintiff is now estopped to assert the  
validity of said letters patent No. 1,046,066 as against this defend-  
ant or as against the public generally by reason of such delayed  
assertion of claim and such abandonment.

(h) Because, in view of the knowledge of persons skilled in the art at the date of the alleged invention of the said Harmatta, the things attempted to be claimed and covered by said letters patent No. 1,046,066, did not embody or involve any substantial variation or change from said prior art, and did not involve the exercise of the inventive faculty or constitute patentable subject matter.

(i) Because by reason of the representations and declarations made by the plaintiff or its predecessor in title to the Commissioner of Patents that Adolph F. Rietzel was the prior inventor over Johann Harmatta, the patentee of the Harmatta patent in suit, in respect of the subject matter of the said Harmatta patent, as shown by the record of the application for the Rietzel patent No. 928,701, and by the record of the proceedings in Patent Office Interference No. 31,792, between the said Rietzel patent and the application for the said Harmatta patent, the plaintiff is now estopped to deny the prior inventorship of the said Rietzel over said Harmatta and also to assert the validity of said Harmatta patent as against this defendant or any other member of the public.

9. Further answering, defendant is informed and believes, and therefore avers, that said letters patent No. 1,046,066 are now involved in an interference proceeding in the United States Patent Office with a pending application of the hereinabove mentioned Sebastian Ziani De Ferranti, which proceeding is known and designated as Interference No. 36,709, De Ferranti v. Harmatta, and is pending and undetermined; that in said interference proceeding the said De Ferranti claims priority of invention over Harmatta in respect to the subject matter of said Harmatta patent No. 1,046,066; that defendant claims the benefit of all the rights of said De Ferranti in respect of said invention, application and interference proceeding, and of all the rights of said De Ferranti under his aforesaid British letters patent No. 11,921, of May 25, 1903, and under his United States letters patent No. 874,398, of December 24, 1907, and No. 1,148,221, of July 27, 1915, and under Section 4887 of the Revised Statutes of the United States, and the International Convention, by virtue of a license from said De Ferranti to this defendant.

10. Further answering, defendant denies that the plaintiff is entitled to any injunction, provisional or permanent, or to any accounting or recovery, or other relief, or to any decree as prayed for in the bill of complaint, and prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

FORD MOTOR COMPANY  
By BARTHEL, FLANDERS & BARTHEL,  
*Its Solicitors.*

MELVILLE CHURCH,  
*Of Counsel.*



## Stipulation.

DISTRICT COURT OF THE UNITED STATES.

EASTERN DISTRICT OF MICHIGAN, SOUTHERN DIVISION.

THOMSON SPOT WELDER COMPANY, Plaintiff

vs.

FORD MOTOR COMPANY, Defendant.

IN EQUITY ON HARMATTA PATENT NO. 1,046,066.

## STIPULATION.

It is hereby stipulated and agreed by and between counsel for the respective parties hereto, subject to the approval of the court, as follows:

I. That the usual printed Patent Office copies of United States and foreign patents may be offered and received in evidence with the same force and effect as the originals or duly certified copies thereof, subject, however, to corrections by comparison with such originals or certified copies; and that the date of application printed upon any such copy of patent shall be *prima facie* evidence of the date of the application for such patent.

II. That either party may take the depositions of witnesses (including experts whose testimony shall be directed to matters of opinion), under the provisions of Sections 863 *et seq* of the Revised Statutes of the United States; those taken by the plaintiff in support of its *prima facie* case to be taken within 30 days of the date hereof; those of the defendant within sixty days after the closing of plaintiff's *prima facie* case and those of the plaintiff, in rebuttal, within thirty days after the closing of the depositions so taken in behalf of the defendant.

III. That the court be requested to fix a day for trial, to enable any witnesses that either party may desire to be called to be examined in open court, in July 1918, or at such earlier time as the business of the court may permit.

J. L. STACKPOLE,  
Counsel for Plaintiff.  
MELVILLE CHURCH,  
Counsel for Defendant.

Boston, Massachusetts, Feb. 20, 1918.

William E. Smith.

7

DISTRICT COURT OF THE UNITED STATES.

EASTERN DISTRICT OF MICHIGAN, SOUTHERN DIVISION.

THOMSON SPOT WELDER COMPANY, Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

IN EQUITY ON HARMATTA PATENT No. 1,046,066.

DEPOSITION of William E. Smith, de bene esse, taken in behalf of defendant by agreement of counsel and under the statutes of the United States, and equity rules at the office of Webber & Turner, 7th floor, Renkert Bldg., Canton, Ohio, beginning at 10:30 A. M. Friday April 19, 1918, before Edward R. Sterling, Notary Public in and for Stark County, Ohio, a duly qualified officer.

Appearances: J. L. STACKPOLE, Esq., for plaintiff;  
A. S. PATTISON, Esq., for defendant.

WILLIAM E. SMITH.

WILLIAM E. SMITH, a witness called by and on behalf of defendant, being first duly sworn, deposes and says:

*Direct examination by Mr. PATTISON:*

Question 1. Please state your name, and residence.

Answer. William E. Smith, 415 Front St., Warren, Ohio.

Q. 2. What is your age?

A. I'll be 44 years old the 16th of May next.

Q. 3. What is your present occupation?

A. I am Captain of Engineers, United States Reserves.

Q. 4. What was your occupation before you entered the Army?

A. I was an electrical engineer.

Q. 5. Where did you begin your electrical education?

A. At the Warren Electric & Specialty Co.

Q. 6. Just state the place, Mr. Smith.

A. Warren, Ohio.

Q. 7. When did you begin this work at that place?

A. In January, 1900.

Q. 8. Are you a married man?

A. Yes.

Q. 9. When were you married?

A. In September, 1899.

Q. 10. Where were you employed at that time?

A. At the Western Reserve Pottery Co., Warren, Ohio.

Q. 11. And was it the January following your marriage that you went to work at the Warren Electric & Specialty Co.?

A. It was.

Q. 12. What kind of work did you do at the factory of the Warren Electric & Specialty Co. when you went there in January, 1900?

A. I was employed there as an armature winder, but at times when there was no armature winding I was employed at other work, in the fan motor department of the Warren Electric & Specialty Co.

Q. 13. What was the product of the Warren Electric & Specialty Co. in 1900?

A. They were manufacturing fan motors, transformers, and electric incandescent lamps.

Q. 14. Were these electrically driven fans?

A. They were.

Q. 15. What work did you do in the manufacture of these electric fans?

A. Principally armature winding.

Q. 16. What kind of metal was used in the fans blades that were manufactured at the Warren Electric & Specialty Co. for the fan season of 1900?

A. Brass.

Q. 17. Was any change made in the metal used for the fan blades at the Warren Electric & Specialty Company while you were there?

A. Yes.

Q. 18. State, if you know, when this change was made, and what kind of material was used in this change?

A. I don't know exactly when the change was made. But it was made previous to the beginning of the manufacturing season of 1901. At about that time they began to manufacture fans with steel blades.

Q. 19. What type of fan, if you know, were these steel blades used in?

A. They were used in what was known in the factory as the cheap fan.

Q. 20. In this cheap fan, what material were the fans guards made of?

A. They were made of steel.

Q. 21. For what season was this cheap fan first put on the market?

A. For the season of 1901.

Q. 22. Was that the first fan put out by the Warren Electric & Specialty Company while you were there, that had the steel blades and the steel fan guards?

A. So far as I know, it was.

Q. 23. State, if you know, of what material the spiders or arms of the fan blades of this cheap, 1901 fan, was composed.

A. They were made of steel.

Q. 24. Who, if you know, designed this cheap fan for the Warren Electric & Specialty Company?

A. F. P. McBerty.

Q. 25. How long have you known Mr. F. P. McBerty?

A. I have known him since January, 1900.

Q. 26. Where does he live?

A. He lives in Warren, Ohio.

Q. 27. What were the duties of Mr. McBerty at the Warren Electric & Specialty Company while you were there?

A. When I first went to work for the Warren Electric & Specialty Company, Mr. McBerty had charge of the designs of machinery used in the manufacture of their products. And he also had charge of any changes in design that was made in the product itself. He was in charge of the power plant. Later he was in complete charge of the whole factory.

Q. 28. Did you see any electric welder at the Warren Electric & Specialty Co. while you were there?

A. Yes.

Q. 29. When did you first see it?

A. I saw it first when it was set up in the factory in January of 1901.

Q. 30. Who designed, if you know, this welder?

A. F. P. McBerty.

Q. 31. In what department of the factory did you see this welder in January of 1901?

A. It was set up in the Fan Motor Department.

Q. 32. What was it used for?

A. It was used for welding together the ends of steel rings used in the guards for the cheap fans.

Q. 33. Was that the only kind of welding you saw this electric welder do?

A. It was not.

Q. 34. What other kind or kinds of welding did you see it do?

A. I saw it used for welding blades to the spiders for the fans used on the cheap fan. It was used by myself and others in welding together scrap fan blades and various things which we found there in the factory, which we welded together.

Q. 35. How were the steel blades of this cheap fan welded to the fan spiders with this machine?

A. The fan blade and spider were placed between the copper electrodes, which were held in the jaws of the welder. By means of cam levers the electrodes were brought to bear upon the blade and spider, holding them in position. The current was then turned on, and at the same time force was applied to the cam levers. When the work had been brought up to the required heat, the current was switched off.

Q. 36. What kind of a weld did this make?

A. I don't just get what you mean by that question, Mr. Patison.

Q. 37. Please describe the kind of weld that was made, as I understand you, between the fan blade and the spider.

A. The work was so positioned between the electrodes that when they were brought together and the current turned on, a small weld was made between the spider and the fan blade.

Q. 38. State the size of the weld as you remember, made as you described.

A. It was from 1/8 to 3/16 of an inch in diameter.

Q. 39. How many such welds were made between the fan blade and the spider?

A. Three welds were made on each blade, and on each arm of the spider.

Q. 40. Was the fan blade and spider welded between these three welds?

A. It was not.

Q. 41. When did you see fan blades and spiders first welded, as you have described?

A. A short time after the welder was set up in the fan motor department.

Q. 42. And when was the welder set up in the fan motor department?

A. In January, 1901.

Q. 43. State the period of time you mean by the expression "shortly after the welder was set up."

A. A few days.

Q. 44. About how far apart were these three welds between the fan blades and spiders?

A. They were about an inch apart.

Q. 45. How many blades did each of the fans have?

A. They had four blades.

Q. 46. Did you see any fans in which all the blades were welded with this machine, as you have stated?

A. I did.

Q. 47. Approximately how many completed fans did you see so welded?

A. At least a dozen. Perhaps more than that.

Q. 48. How were the blades attached to the spiders, when not welded, as you have described?

A. They were attached by means of rivets.

Q. 49. Were rivets used when the blades and spiders were welded together?

A. Rivets were not used in that case.

Q. 50. Then did these three welds, you have referred to, take the place of and serve the purpose of rivets previously used?

A. They did.

Q. 51. You have stated that you, yourself, operated this welder. What kind of welding did you do with it?

A. I welded the rings together that were used in the fan guards, other pieces of steel such as nails, also scrap fan blades, and other pieces of sheet steel, that I found in the factory.

Q. 52. Have you done any welding with this machine since you was employed at the Warren Electric & Specialty Co?

A. I have.

Q. 53. When did you do this welding with this machine?

A. About a year ago.

Q. 54. Please produce, if you can, some of the welding which you did with this machine about a year ago.

(Objected to as immaterial.)

A. These are two of the pieces that I welded about a year ago.

(Witness produces two pieces so welded.)

Q. 55. State whether these welds in these samples are the same as the welds that you made with this machine in January 1901.

A. They appear to be the same as those that I made at that time.

Q. 56. Were you interested in this welder in January, 1901?

A. Yes.

Q. 57. To what extent?

A. At that time I was not well informed on electrical subjects, and I was very much interested in the machine, as I desired to take up the study of electricity; and because of that, I took a great interest in the machine.

Q. 58. Did you examine and operate the machine often during the fan season of 1901?

(Question objected to as leading.)

A. I did.

Q. 59. State approximately how often you examined and operated this electrical welder during the fan season of 1901.

A. I examined and operated it at almost every opportunity that I had during the early part of that season.

Q. 60. Can you state what part of the day you operated the machine, and why?

A. I usually operated it during the lunch hour. That was the only time which the machine was not in use by the regular operator.

Q. 61. State as nearly as you can, how many times you operated the machine during the fan season of 1901.

A. I should say a hundred times.

Q. 62. Was this McBerty welder the first electric welder you had ever seen?

A. It was.

Q. 63. Was this machine in the room where you worked, or in a different room?

A. It was in the room where I worked.

Q. 64. During the fan season of 1901, did you make many such welds as are shown in the samples that you have produced?

A. Yes.

(Mr. Pattison: The samples produced by the witness as illustrative of the welding done by him on the McBerty machine during the 1901 fan season are marked for identification "Exhibit A, Smith's samples of welding done on McBerty machine.")

(The exhibit is objected to as immaterial, as the witness has stated that the samples were made last year; and, for the same reasons, objection is made to the remarks of counsel that they represent the style of work done by the witness in 1901.)

Q. 65. I call your attention to these samples again, and ask you to examine the welds, and state if they differ in any respect from welds which you say you did on the McBerty machine in 1901. (Meaning "Smith's samples of welding done on McBerty machine.")

(Objected to as leading.)

A. As far as I can see, they are the same.

Q. 66. Did you observe other employees at the Warren Electric & Specialty Company manifesting interest in this electric welder in 1901?

A. I did.

Q. 67. Please name some of the employees that you observed manifesting interest in this welder.

A. Ed Craft, E. C. Lipps, Harvey Eckenrode, John Gilder, John McDonald, Clyde Storier. There were also others.

Q. 68. Do you know whether catalogs were issued by the Warren Electric & Specialty Company while you were there?

A. I do.

Q. 69. Did you see any of the catalogs that were issued while you were there?

A. Yes.

Q. 70. Would you recognize catalogs if they were shown to you?

A. I would.

Q. 71.

(Mr. Pattison: I hand you what appears to be two catalogs, and ask you to state what they are.)

A. They are catalogs issued by the Warren Electric & Specialty Co.

Q. 72. For what seasons?

A. Seasons of 1900 and 1901.

Q. 73. I hand you the catalog which appears to be for the season of 1900, and ask you whether you recognize it as the catalog for that season.

A. I do.

(Mr. Pattison: The catalog just recognized by witness as Warren Electric Specialty for season of 1900 is marked for identification, "Exhibit 1, Warren Electric Specialty Co.'s 1900 fan catalog.")

Q. 74. Please examine this catalog and state whether the cheap fan, to which you have referred, is contained in this catalog

A. The cheap fan is not shown in this catalog.

Q. 75. I hand you a catalog, which purports to be for the year 1901, and ask you what you recognize it to be.

A. I recognize it to be Fan Catalog of the Warren Electric & Specialty Co. for 1901.

(Mr. Pattison: The catalog just recognized by the witness is marked for identification "Exhibit 2, Warren Electric Specialty Co's 1901 catalog.")

Q. 76. Please examine this catalog, and state whether you find in it a representation of the cheap fan, to which you have referred, meaning the last catalog, Exhibit 2.

A. I find cuts of the cheap fan in this catalog on page 17.

Q. 77. What, if anything, in these catalogs enable you to say as to the time the cheap fan you have referred to, was first put on the market?

A. From the construction of the fan as shown in the cut, I recognize them as the cheap fan, which was made in 1901, and put on the market that same season.

Q. 78. Do you mean that that was the first season that it was put on the market?

A. I do.

Q. 79. What type of fan in this 1901 catalog is the cheap fan?

A. G-1 and G-2, shown in this catalog.

Q. 80. Wherever in your deposition you have referred to the "cheap fan," state whether you have reference to the G-1 and G-2 type, appearing on page 17, of Exhibit 2 of the 1901 catalog.

A. Type G-1 and G-2 are the fans which I have referred to as the "cheap fan."

Q. 81. State whether these catalogs enable you to say what year the McBerty welding machine was first put in use.

A. In so far as they show that the fan which was known as the "cheap fan" was placed on the market during that season, and from my knowledge that the welder was designed and used for the purpose of manufacturing these fans, they do.

Q. 82. What year do these catalogs enable you to say that the McBerty welder was built and first used?

A. It was built in the latter part of 1900 and was first used in the early part of 1901.

Q. 83. In 1901, when you saw these welds in spots like your sample marked for identification "Exhibit A," and which you have referred to in your testimony as being welded by you and others,



did you at that time regard these welds as effective to serve the purpose of rivets?

A. I did.

Q. 84. What tests, if any, did you personally make in 1901 to determine the strength of the welds that you made like those shown in "Exhibit A," sample?

A. I tore the pieces apart to see how strong the welds would hold them together.

Q. 85. What was the result of this test?

A. I found that the metal would tear out of the piece around the weld before the weld would break.

Q. 86. Did you or not make only one of such tests?

A. I made several such tests.

Q. 87. What conclusion did you reach from these tests in 1901, as to the success and effectiveness of these welds?

A. I considered that they were as good and effective as the rivets which were ordinarily used.

Noon recess.

Q. 88. I call your attention to a machine marked for identification "Exhibit B," and ask you whether you recognize it?

A. I do.

Q. 89. What is it?

A. It is the welding machine designed by Fred P. McBerty, which was used in the Fan Department beginning January 1901.

Q. 90. Is this the machine on which you say you made welds in spots January 1901?

A. It is.

Q. 91. Do you recognize it as the original machine?

A. I do.

Q. 92. Did the machine, when you operated it in 1901, have a switch for opening and closing the circuit?

A. It did.

Q. 93. How was this switch operated?

A. It was a foot-operated switch.

Q. 94. Do you find a foot-operated switch on this machine. "Exhibit B"?

A. I do.

Q. 95 I show you two photographs marked for identification "Exhibits C and D," and ask you whether these photographs represent the way you saw the machine used in January, 1901, for welding the blades to the spiders, in the cheap fan?

A. They do.

Q. 96. I hand you a photograph marked for identification "Exhibit E," and ask you what it is.

A. It is a photograph of the welding machine designed by Fred P. McBerty, marked for identification "Ex. B."

Q. 97. Is this the machine on which you did welding in spots, as you have described, in January 1901?

A. It is.

Q. 98. Do you know whether the copper rods or electrodes clamped in this machine are the same ones that were in the machine when you operated it in January, 1901?

A. I do not.

Q. 99. Examine these copper rods or electrodes in this Ex. B, McBerty machine, and state whether how, if in any respect, they differ in construction from the rods or electrodes that were in the machine when you operated it, and did welding in January 1901?

A. The rods are about the same diameter and length, as those used in the machine when I operated it in 1901.

The points, however, were not so blunt as those that are now in the machine.

Q. 100. How about the four levers that are in this machine, Exhibit B?

A. The two upper levers now on the machine are the ones that were used on the machine in 1901. The lower levers are about the same shape as those that were on the machine in 1901, but they appear to have been made since that time.

Q. 101. What was the function of the upper levers on the machine in 1901, when you operated it?

A. The upper levers were used to force the jaws against the steel rings, which were welded at that time.

Q. 102. What function did they perform when the copper rods were used, when you operated it in January, 1901?

A. They were used to force the jaws against the copper rods and to hold them in position while the cap screws, which hold the jaws, were screwed down.

Q. 103. What was the function of the two lower levers in January 1901, when you operated it?

A. They were used to bring the points in contact with the parts to be welded, and by added pressure at the proper time to complete the weld.

Q. 104. What is this thing or device that stands vertical on the platform of this machine?

A. It is a transformer.

Q. 105. Was that in the machine when you operated it in January, 1901?

A. It was a part of the machine.

Q. 106. How about the cables?

A. They are the ones that were used at that time.

Q. 107. How about the jaws, which in one instance you say were used to clamp the copper rods or points, and in another instance to clamp the rings, when welding was done.

A. The jaws are the same ones that were used at that time.

Q. 108. Of what material were the things you once referred to as "points" when you operated the machine in January 1901?

A. Copper.

Q. 109. Are these "points" the same elements that you have sometimes referred to as "electrodes" and "copper rods"?

A. They are the same.

Q. 110. Was this Exhibit B, McBerty machine, located in the factory, where it could be seen by anyone, in January 1901?

A. It was so located that it could be seen by anyone in the Fan Motor Department.

Q. 111. State whether or not these welding operations made, as you have described, in January 1901, were or were not openly conducted.

A. They were openly conducted.

Q. 112. Was there any effort or intention to conceal this machine or its operations in January 1901?

A. There was none. It was shown to all visitors.

Q. 113. Was this, likewise, true during the whole time you were at the Warren Electric & Specialty Co.?

A. It was.

Q. 114. To what extent were the employees of the Warren Electric & Specialty Company and outsiders permitted to see this Exhibit B machine, and its operation in welding, as you have described, in the Fan Department of the Warren Electric & Specialty Company, in 1901?

A. There was no attempt made to keep the machine or any work done on it secret.

Q. 115. Do you mean by this that any employee of the Warren Electric & Specialty Company might examine the machine, and its operation, and that outsiders might do the same during the year 1901?

A. I do.

Q. 116. To what extent did you observe employees of the factory examine the machine and its operation?

A. During the lunch hour, a great many of the employees operated the machine, and watched others operate it. At other times, during working hours, it was used by employees, who happened at the time to be not engaged in their regular duties.

Q. 117. Do you recall seeing anyone from the outside examine this machine, other than the employees?

A. Yes.

Q. 118. Was this during the first year of its installment at the factory?

A. It was.

Q. 119. State whether or not the examination by employees of the company and outsiders, other than the employees, included the use of the machine for welding in spots, as you have described.

A. It was examined by the employees, including the use of the machine for welding in spots.

Q. 120. How about outsiders during that period of time?

A. I don't know whether outsiders were shown this operation or not.

Q. 121. I show you a blue print marked for identification. "Exhibit E." and ask you whether that blue print properly shows the

plan of the floor of the building, where this machine was built and operated in January 1901?

A. It does, with a few exceptions. A door was in the building near the place marked "punch press." There was also a toilet room at the right of the door into the packing and stock room.

Q. 122. How about the location of the part marked "welding bench?"

A. My recollection is that the welding bench was nearer the center of the room, than shown on the blue print.

Q. 123. When did you leave the employment of the Warren Electric & Specialty Co.?

A. I was with the Warren Electric & Specialty Co. when its fan motor and transformer business was taken over by the Peerless Electric Co.

Q. 124. Can you state whether this welder was also taken over by the Peerless Electric Co.?

A. It was moved with the rest of the machinery at the time the change was made.

Q. 125. When did you leave the employ of the Peerless Electric Co.

A. January 1st, 1905.

Q. 126. Was your employment with the Warren Electric & Specialty Co. and the Peerless Electric Co. continuous from January 1900 to January 1905?

A. It was not.

Q. To what extent was it not continuous?

A. During the dull season, some of the employees were allowed to take two weeks' vacation. At one time, for about a month, I was engaged in other work, but returned to the Peerless Electric Co. at the end of that time.

Q. 128. Did you, at any time after leaving the employ of the Peerless Electric Co., build an electric welder?

A. I did.

(All testimony as to the witness said after January 1st, 1905, is objected to as immaterial.)

Q. 129. Where, and about when did you build this welder?

A. At the Ohio Works of the Carnegie Steel Company at Youngstown, Ohio, between February and June, 1905, inclusive of the two months.

Q. 130. What were your duties at this latter place?

A. I was employed as an armature winder and transformer repair man.

Q. 131. I hand you a blue print marked for identification "Exhibit G," and ask you to state if you know what it represents.

A. It represents the welder which I built at the Ohio works of the Carnegie Steel Company in 1905, at the time it was first completed. It was later changed by fastening one of the movable

parts marked "A" to the base plate, and by the addition of a toggle and lever which was attached to the opposite part marked "A."

Q. 132. Was any welding done with the machine, as illustrated in this blue print?

A. Yes.

Q. 133. What kinds of welding?

A. It was used for welding pieces of half-inch rod together. Some welds were made in copper wires. It was used for welding together overlapping steel plates, and for welding together resistance ribbon.

Q. 134. What are the parts marked "D" in this blue print?

A. They represent the copper electrodes that were used in this welding.

Q. 135. What did these electrodes do in this welder?

A. By means of these electrodes pieces held between them were welded together. The ends of the resistance ribbon was overlapped between the points of the electrodes. They were then worked together by means of the levers marked "E", and the weld made by means of a switch, which turned the current on and off.

Q. 136. What kind of a weld did these electrodes "D" make?

A. They made a small circular weld about  $3/16$  of an inch in diameter.

Q. 137. How did the welds differ, if at all, from the welds shown in "Exhibit A," Smith's sample?

A. There was no difference, except that possibly the welds made by the machine which I built at the Ohio works of the Carnegie Steel Company were a little larger.

Q. 138. Where did you obtain the knowledge from which you were able to make your machine to weld in spots, as you have stated?

A. From work that I had seen done and had done, myself, on the machine made by F. P. McBerty at the Warren Electric & Specialty Company's factory.

Q. 139. Is this it, marked "Exhibit B"?

A. It is.

Q. 140. Did your machine make good or bad welds in spots?

A. It made good welds.

Q. 141. Is this machine now in existence?

A. I don't know. I understand that it was torn down sometime ago to secure the copper, which it contained, for use in the steel-making process at the plant of the Carnegie Steel Co.

Q. 142. Explain how the current flowed in Exhibit B, McBerty machine, when you used it for making welds in spots in January, 1901, if you knew, at that time?

A. As I understood it at that time, the current flowed through the pieces to be welded from one electrode to the other thus heating the pieces to be welded to the required heat. When this heat was obtained, pressure was applied to the levers, thus completing the weld.

Q. 143. Do you know Mr. Albertus C. Taylor, of Warren, Ohio?

A. I do.

Q. 144. Do you remember whether he was employed by the Warren Electric & Specialty Company, or the Peerless Electric Company, while you were employed with these companies?

A. He was employed by them at that time.

Q. 145. Do you know whether he saw this Exhibit B, McBerty machine, at one of these companies?

A. He did.

Q. 146. Do you know what company he is now connected with?

A. At the time I left home, about January 1st, this year, he was employed at the Winfield Company, Warren, Ohio.

Q. 147. Do you know whether the Winfield Company built and sold Commercial spot welding machines while Mr. Taylor was with them?

A. They did.

Q. 148. Do you know whether Mr. Taylor had anything to do with the designing or building of the spot welding machines of the Winfield Company?

A. It was common knowledge, and I have no reason to doubt it, that he was chief designer for the Winfield Company.

(Answer is objected to as guessing.)

Q. 149. Have you any interest whatever in any of the facts to which you have testified?

A. I have none.

Q. 150. Have you any interest whatever in the outcome or final result of this case, in which you have given your deposition?

A. I have not.

Direct examination closed.

*Cross-examination by MR. STACKPOLE:*

X-Q. 151. Where were you employed before you entered the employ of the Warren Electric & Specialty Co.?

A. I was employed at the Western Reserve Pottery Company, Warren, Ohio.

X-Q. 152. In what capacity?

A. As a steam engineer.

X-Q. 153. For what period?

A. About six months.

X-Q. 154. Before that where were you employed?

A. I was collector for the Milldale Jersey Farm, their business being located in Pittsburgh, Pa.

X-Q. 155. When you entered the employ of the Warren Elec-

tric & Specialty Co. had you had any previous experience in electric welding?

A. None at all.

X-Q. 156. After you left the employ of the Peerless Company, by whom were you employed?

A. By the Carnegie Steel Co., Youngstown, Ohio.

X-Q. 157. For what period of time, and in what capacity?

A. I was employed there from about the middle of January, 1905, until about the last of October, 1907. I was employed there in the beginning as an armature winder and transformer repair man, and later as sub-foreman in charge of the electric repair shop.

X-Q. 158. After that by whom were you employed?

A. By the Indiana Steel Co., Gary, Indiana.

X-Q. 159. For how long and in what capacity?

A. For about two years, as foreman of the electrical repair shop.

X-Q. 160. And after that where were you employed, for how long, and in what capacity?

A. By the Peerless Electric Co., as foreman of their winding department. From about Sept., 1909, to December, 1911.

X-Q. 161. Is that the same Peerless Electric Co. as you have been already talking about?

A. It is.

X-Q. 162. While you were with the Peerless Company during this period did you see the "Exhibit B"?

A. I did not.

X-Q. 163. And after that where were you employed?

A. By the Carnegie Steel Co., Youngstown, Ohio, from January, 1912, to March, 1912, as armature winder.

X-Q. 164. Then after that where were you employed?

A. By the Virginian Electric & Machine Company, as foreman of their factory, from March 1st, 1911, to March 1, 1912.

X-Q. 165. After that where were you employed?

A. By the Carnegie Steel Co., Youngstown, Ohio. From March 1st, 1912, to August 1st, 1912, as armature winder.

X-Q. 166. Then after that?

A. By the DeForest Sheet & Tin Plate Co., Niles, Ohio, in charge of their power plant and armature winding, from August 3rd, 1912, to April 1st, 1917.

X-Q. 167. Then after that?

A. By the Welding Patents Investigating Committee, Canton, Ohio. From April 1st, until July 1st, 1917.

X-Q. 168. What was the nature of your employment by the Investigating Committee?

A. I was engaged by them in collecting evidence having to do with a patent on electric welding, in which they were interested.

X-Q. 169. Specifically, you were engaged by that Committee in looking up evidence concerning this McBerty machine, were you not?

A. Yes.

X-Q. 170. During 1917 you saw this McBerty machine at the plant of the National Electric Welder Company, at Warren, Ohio, did you?

A. I did.

X-Q. 171. It was there in charge of Mr. McBerty, was it not?

A. It was.

X-Q. 172. While it was there did you and Mr. McBerty test the machine and make experiments with it?

A. We did not.

X-Q. 173. Did not either of you test it?

A. We were both operating it.

X-Q. 174. For what purpose?

A. For the purpose of making spot welds.

X-Q. 175. On what articles?

A. On fan blades and spiders, on pieces of fan blade, and pieces of transformer iron.

X-Q. 176. Did the National Electric Welder Company sell the articles which you and Mr. McBerty spot-welded with this machine?

A. Not to my knowledge.

X-Q. 177. So your operation was not for commercial purposes, was it?

A. I did not understand that it was.

X-Q. 178. But for the purposes of this case?

A. They were not made for the purposes of this case.

X-Q. 179. How do you draw that distinction?

A. This case was not started at that time.

X-Q. 180. When was this case started?

A. Just recently.

X-Q. 181. Mr. McBerty had reason to believe that a suit on the Harmatta patent would be started, did he not?

(Question objected to as immaterial what Mr. McBerty thought, and that it is obviously not within the knowledge of the witness.)

A. I do not know.

X-Q. 182. Is the Exhibit B, including the welding device and the transformer, in exactly the same condition it was in in January, 1901?

A. It is not.

X-Q. 183. What are the differences?

A. In 1901 the clamping device was mounted on a shop bench; the transformer being located beneath the bench; the foot-operated switch was located in a different position. It does not have the same lower levers which it had at that time.

X-Q. 184. Is the transformer, itself, the same?

A. The transformer is the same.

X-Q. 185. Is the transformer connected in the same way?



A. The secondary of the transformer is connected in the same way. The primary connections may not be the same.

X-Q. 186. How many turns are there in the primary of the transformer in each leg.

A. I do not know.

X-Q. 187. Do you know where this transformer came from?

A. I do not. It is the same type as those built by the Warren Electric & Specialty Company at that time.

X-Q. 188. When the transformer was used in the machine in January, 1901, did it have a casing on it?

A. It did not.

X-Q. 189. At the time this transformer was used in this way was the Warren Electric & Specialty Company making other transformers exactly like this one?

A. They were making other transformers, but I never saw another transformer exactly like this one.

X-Q. 190. What is peculiar about this transformer to distinguish it from the other one?

A. It has the primary winding placed next the core, while the regular type of transformer, built by the Warren Electric & Specialty Co., had the secondary winding placed next to the core.

X-Q. 191. Is the wire of the primary winding in this transformer square in cross-section or round?

A. I do not know.

X-Q. 192. Where did the primary current come from to this transformer in the Works of the Warren Electric & Specialty Co.?

A. From where it was generated in the power plant of the Warren Electric & Specialty Co.

X-Q. 193. What was the voltage of that current?

A. Do you mean by that the voltage of the current where it entered the transformer?

X-Q. 194. Yes, if you can give it.

A. I think it was 220 volts.

X-Q. 195. And about how many amperes?

A. I do not know.

X-Q. 196. What was this current used for in the factory?

A. It was used for lighting, testing incandescent lamps, and for electric welding.

X-Q. 197. When you had the McBerty machine at the plant of the National Electric Welder Company, were the clamps placed on a work bench?

A. No. They were placed as they are now located.

X-Q. 198. You mean that the entire machine was assembled in the framework as it now appears?

A. Yes.

X-Q. 199. Is the framework the same?

A. It is with the exception of that board in front. That may or may not have been on the frame at that time. (Witness referring to board above the foot switch.)

X-Q. 200. The bolts which fasten the clamps to the wooden crosspiece look new, and are not of the same size. Do you know the reason for this?

A. I do. When we removed the welder from the box, in which it was shipped from Warren to Canton, we found one of the bolts missing, which held one side of the base plate, to the cross piece of the frame. To prevent this piece from falling from the frame we inserted a temporary bolt, which was the smaller bolt.

X-Q. 201. The small bolt is the new one, is it?

A. It is.

X-Q. 202. The right sized bolt had been lost, as I understand it?

A. It was not in the machine when we removed it from the box.

X-Q. 203. Did this particular table top or cross piece, to which the clamps are now bolted, come to the National Electric Welder Company with the machine?

A. I do not know.

X-Q. 204. When the clamps came to the National Electric Welder Co. they were separate from one another, were they?

A. I do not know.

X-Q. 205. Then I understand that you fastened on the left hand clamp piece to the wooden cross piece by a new bolt this morning?

A. We did.

X-Q. 206. Did you see the machine in the condition in which it was received by the National Electric Welder Co.?

A. I did not.

X-Q. 207. Did you have anything to do with assembling the machine on the frame bench at the National Electric Welder Co.?

A. I did not.

X-Q. 208. When the machine was assembled at the works of the National Electric Welder Company, was the large red fiber piece, and the two smaller grey fiber pieces clamped between the clamps of the machine?

A. I don't know.

X-Q. 209. When the machine was in use at the Warren Electric & Specialty Company, were these three fiber pieces, the one red and the two grey, clamped between the clamps of the machine?

A. I do not know that they are the same pieces.

X-Q. 210. The ends of the clamps, which project into the cross piece, are now held together by a screw, are they not?

A. I don't see the screw. I don't know whether that's a screw or a bolt.

X-Q. 211. At any rate there is a hole in the depending flange of the left hand clamp and a screw threaded hole in the depending flange of the right hand clamp, the two holes being in line, and adapted to receive a screw. That is so, isn't it?

A. It is.

X-Q. 212. On the outside of the depending flange on the left hand side, I see very plainly the marks of a head of a screw or a washer. Do you see them?

A. I do. And I also notice that the hole is bushed with a mica bushing. And that the washer just mentioned evidently was made of mica.

X-Q. 213. For the purpose of insulating the screw from the hole in the left hand depending flange? That was the object of the mica?

A. Yes.

X-Q. 214. This would indicate, would it not, that at sometime, the two depending flanges were held together by a screw at their front ends, but that they were maintained electrically insulated from one another?

A. Yes.

X-Q. 215. When you worked on this machine at the National Electric Welder Company, was this screw in place?

A. Owing to the position of the clamping device on the bench at that time, I am not able to state.

X-Q. 216. I think you mistook my question and answered it with reference to the condition of the machine when it was on the bench at the Warren Electric & Specialty Co., did you not?

A. I did.

X-Q. 217. So the fact is that owing to the position of the device on the bench, when it was in use, at the Warren Electric & Specialty Company, you do not know whether the screw held the two clamps together at the front end, is that correct?

A. That is correct.

X-Q. 218. What was the position of the device on the bench at the Warren Electric & Specialty Company which would conceal the presence or absence of this screw?

A. The clamping device did not extend so far out past the edge of the bench at the Warren Electric & Specialty Company as it now does, as it is mounted.

X-Q. 219. From the looks of the depending flange on the right hand side of the right hand depending flange, there seems to be a distinct mark of some sort about an inch and a half from the outer end. Would you say that that mark indicated where the edge of the bench came to, so to conceal the screw?

A. There is such a mark on the flange, and it is possible that this marks about the location of the edge of the bench.

X-Q. 220. Does that agree about with your recollection of the matter?

A. It does.

X-Q. 221. Now, if these two depending flanges had been held together by a screw, there would have been an interposed piece of fiber to hold them apart, would there not?

(Objected to as merely calling for the opinion of the witness.)

A. Naturally some means would have to be provided for holding the clamps in position.

X-Q. 222. And separated from one another the proper distance?  
A. Yes.

X-Q. 223. Do you recall the use of such a piece of fiber as I have just referred to, when the machine was in use, at the Warren Electric & Specialty Co.?

A. I do not.

X-Q. 224. I notice near the front end of the movable clamp what appears to be pieces of fiber inset, into the clamps. Are these pieces of fiber, or what are they?

A. They are pieces of fiber.

X-Q. 225. And what is their object?

A. Their object is to insulate the movable jaws in case they should accidentally be brought in contact while the current is on the transformer.

X-Q. 226. I notice on the rear ends of the movable clamps projecting pieces of wire. What are these for?

A. I understand you to refer to the quarter inch rods extending from the rear end of the movable jaws. The tension of a spring connected across the insulated ends of these rods tended to oppose the action of the levers on the front of the movable clamp, which ordinarily held the jaws apart, when the machine was not in operation.

X-Q. 227. As I understand you, this clamping device was mounted on the work bench at the Warren Electric & Specialty Company, exactly as it is mounted on this cross piece in this Exhibit B, except that the ends of the device stuck out when it was at the Warren Company, about an inch and a half from the side of the bench, instead of about five inches and three quarters, as is now the case in the exhibit. Is that correct?

A. As I remember the clamping device, it did not project as far over the edge of the bench at the Warren Electric & Specialty Company as it does, as now mounted, in Exhibit B.

X-Q. 228. It extends beyond the edge of the bench in Exhibit B about  $5\frac{3}{4}$  inches, does it now?

A. It does.

X-Q. 229. This spring that pulls up the switch lever, in Exhibit B, seems to be a new spring. Do you know when this spring was put on this exhibit?

A. I do not. I think both the switch and spring are new.

X-Q. 230. By "new," do you mean put on since the machine was at the National Electric Welder Company?

A. By "new," I mean that it is not the original switch that was used on the machine at the Warren Electric & Specialty Company.

X-Q. 231. When the machine was at the Warren Electric & Specialty Company, did you operate it from time to time to make spot welds, as you have testified, up to the time when you left that company?

A. I did not.

X-Q. 232. When was the last time that you recall that you operated it for making spot welds?

A. After the Peerless Company took over the fan motor and transformer business of the Warren Electric & Specialty Co., the welder was moved with the rest of the machinery and placed in another part of the building from where I worked. I did not operate the welder after this change was made.

X-Q. 233. In what month of what year was that change made.

A. Owing to the fact that the employees continued working during the change, I can not state just when the change was made; but I think it was about the first of July, 1902.

X-Q. 234. Was it part of your employment to operate this welder, as a butt welder?

A. It was not.

X-Q. 235. Was it part of your employment to operate it as a spot welder?

A. It was not.

X-Q. 236. When you operated it, you were doing so because of your personal interest?

A. I was.

X-Q. 237. I notice in this Exhibit B two extra leads from the secondary terminals. What were these leads connected to?

A. I don't know.

X-Q. 238. Do you recall these two extra leads as having been on the machine when it was at the Warren Company?

A. I do.

X-Q. 239. Were they connected with anything at that time?

A. I never saw them connected with anything at that time.

X-Q. 240. I notice that in this Exhibit B, that the steel brackets which secure the top of the core of the transformer to the frame and their bolts, appear to be new. Do you agree with me in this?

A. Just what do you mean by "new."?

X-Q. 241. As if they had been applied to the machine within a year or two.

A. I think the bracket has been applied within that time.

X-Q. 242. Do the clamps, which hold the laminations of the core together appear to you to be equally new, as are the brackets?

A. They do.

X-Q. 243. Now what is the diameter of the copper rods now in the clamps of this Exhibit B?

A. I don't know. I would require a micrometer to obtain the exact size. I could make a guess almost as close as I could come with a rule.

X-Q. 244. They appear to me to be very close to  $3/8$  of an inch in diameter. Do you deny this?

A. I think they are less than  $3/8$  of an inch in diameter.

X-Q. 245. Are they over five-sixteenths?

A. I do not care to guess. If it is necessary to obtain the correct diameters, it can be done with a micrometer.

X-Q. 246. Well, make your best estimate now of the diameter of these copper rods, as you do not have a micrometer.

(Objected to by defendant's counsel, as stated, he does not care to hazard a guess; and that there is a perfectly fair means of obtaining the correct diameter.)

A. Well, I'll put it between certain limits. The diameter appears to be between a quarter of an inch and three-eighths of an inch.

X-Q. 247. Is that as near as you can measure it with the rule that I hand you, which is marked in sixteenths of an inch?

A. My reason for objecting to giving the measurements taken across the ends of the rods as the true diameter, is that they appear to be enlarged at the ends, which are very nearly  $5/16$  of an inch in diameter.

X-Q. 248. Do you find between each pair of clamps a strip of copper, together with the copper rods?

A. There are strips of what appear to be copper between the clamps together with the copper rods.

X-Q. 249. Will you measure as accurately as you can with this rule the distance between the stationary jaw and the movable jaw on the clamps of the machine? And, if so, state what you find the distances to be.

A. Nearly three-eighths of an inch.

X-Q. 250. On the right hand clamp, the cam the lever is stamped with the figure 3, on its upper side. Now, placing this lever in such position that its end is as close as possible to the movable jaw, do you find that it touches the movable jaw?

A. I find that it does not.

X-Q. 251. How large in diameter were the guard rings that were welded on this machine?

A. There were two kinds of guard rings. That is, there were two kinds of the large guard rings, one being square and the other round. For the purpose of holding these, different shaped jaws were made purposely for each kind. These rings were about  $1/4$  inch in diameter, that is the stock was quarter inch steel, for both the round and square rings.

X-Q. 252. Were the holding faces of the jaws for these rings curved?

A. They were.

X-Q. 253. In changing the machine to adapt it for spot welding, after it had been used for butt welding the curved rings, would you change the four jaws on the machine?

A. Yes.

X-Q. 254. And change the four jaws again when you went back to butt welding the ends of the rings? Is that so?

A. Yes. A pair of jaws was provided for each kind and size of rings.

X-Q. 255. Before you welded the ends of the fan guard rings, at the Warren Electric & Specialty Co., how were the ends of the rings joined together?

A. They were joined by means of one end of the ring being grooved, and on the other end a tongue was made to fit the groove. There were drilled and pinned. In some cases both ends were grooved. A thin piece of brass was inserted on both ends, and after they were brought together, they were pinned in place.

X-Q. 256. Do you know the source from which Mr. McBerty got his ideas for making this welding machine, Exhibit B, for welding ends of the fan guard rings?

A. I do not.

X-Q. 257. Don't you know that the ideas came from Mr. Craft?

A. I do not.

X-Q. 258. Don't you know that Mr. Craft visited the Pneumatic Wheel Co., at Freehold, N. J., and saw an electric welder there, and came back and told Mr. McBerty about it?

A. No, sir.

X-Q. 259. Have you ever seen a copy of an affidavit made by Mr. McBerty, which had the caption of the suit of the Thomson Electric Welding Company vs. Barney & Berry?

(Question is objected to because if such a thing is in existence it should be shown to the witness.)

A. I do not remember seeing such an affidavit, or copy.

X-Q. 260. Where were you during the year 1913?

A. I was employed at the plant of the DeForest Sheet & Tin Plate Co., Niles, Ohio.

X-Q. 261. Did you see Mr. McBerty during that year or have any communication with him?

A. I don't remember having any communication with him during that year, but may have seen him during that time.

X-Q. 262. Were you living at Warren during that time?

A. I was.

X-Q. 263. Do you know where Mr. McBerty was during that time?

A. He was living in Warren during that time.

X-Q. 264. Were you on good terms with him during that time?

A. Yes.

X-Q. 265. Did you ever meet a Mr. Thomas Howe, who was investigating the history of this McBerty machine?

A. Not that I recall now.

X-Q. 266. You have looked up other persons, who have had knowledge of this McBerty machine in the interests of the Welding Patents Investigating Committee?

A. I have.

X-Q. 267. And you have talked with them about the history of the machine?

A. I have.



X-Q. 268. Who were those persons?

A. Clyde Storer, John Gilder, Harvey Eckenrode, J. S. Powers, E. C. Lipps, Clyde Campbell, George Spade, Charles Wolf, Curtis Brewer. There may have been others. James Blott. I think that's all. All I can think of now.

X-Q. 269. You did this work in 1917?

A. Yes.

Adjourned at 5:30 P. M. until 9 A. M. Saturday, April 20, 1918.

Canton, Ohio, April 20, 1918.

9:25 A. M.

Met pursuant to adjournment.

Present, same parties as yesterday.

X-Q. 270. So far as you know, has the transformer now in the McBerty machine, Exhibit B, ever been removed and another transformer substituted to be used with the clamping device now associated with the present transformer?

A. Not so far as I know.

X-Q. 271. You notice in the transformer of this machine a number of taps or leads coming from the primary of the transformer, and that these taps are marked with little metal tags, indicating the voltage of the taps. That is so, is it not?

A. I notice the taps mentioned, but do not think that they indicate the voltage applied to these taps.

X-Q. These tags are marked respectively, 2V, 3V, 3.5V, 4V, 4.5V, are they not?

A. They are.

X-Q. And there is another tag marked Zero?

A. Yes.

X-Q. 274. Do not these tags indicate the voltage obtained from the secondary, when the primary line wire is connected to these taps at the points indicated by the tags?

A. I believe they do, provided that the proper voltage is applied at these primary taps.

X-Q. 275. What is the proper voltage?

A. I believe it to be 220 volts.

X-Q. 276. What are the reasons for this belief of yours?

A. Because as I believe that was the voltage used in the welder at the factory of the Warren Electric & Specialty Co.

X-Q. 277. In the machine, as it now stands, what is the tap marked, to which the primary line wire is connected?

A. To what do you refer as the primary line wire?

X-Q. 278. I mean the long wire connected to the taps at the back of the transformer, that has a free end, and is about eighteen inches long.



A. It is marked 2V.

X-Q. 279. Would that indicate that if the machine were used as it is now connected up, and assuming that the wire referred to is the line wire, and that the wire to one of the switch terminals is the other line wire, that the voltage across the terminals of the transformer would be two volts?

A. As the machine stands, it is not connected up to anything, but if it was connected, as assumed, in this question, to a line of the proper voltage, the tag would, I believe, indicate the voltage across the secondary terminals, that is, two volts.

X-Q. 280. What was the voltage across the secondary terminals of this machine as you used it at the Warren Electric & Specialty Co.?

A. I do not know.

X-Q. 281. Was the machine used with the same voltage across the secondary terminals for both butt welding and spot welding?

A. So far as I know, there was no change in the voltage across the secondary terminals for either kind of welding.

X-Q. 282. What was the voltage across the secondary terminals of this machine, when you operated it last year at the works of the National Electric Welder Co.?

A. I do not know.

X-Q. 283. What is the kilowatt capacity of the transformer in this machine?

A. I do not know.

X-Q. 284. As an electrical engineer can't you answer this question?

A. I can not.

X-Q. 285. Assuming that the machine is operating with the primary current of 220 volts, and a voltage across the terminals of the secondary is two volts, what was the amperage of the currents delivered by the secondary for the welding operation?

(Question objected to because based on an hypothesis.)

A. I do not know.

X-Q. 286. Does not your experience as an electrical engineer enable you to answer the last question?

A. It does not.

X-Q. 287. I notice in this machine Exhibit B, a vertical groove in each of the opposing faces of the stationary clamps just under the electrodes now present in the machine. When did you first notice these vertical grooves?

A. I do not have any recollection of noticing those grooves previous to this time.

X-Q. 288. Do you know the purpose of these grooves?

A. I do not.

X-Q. 289. I notice in each of the lateral parts of the stationary clamps tap holes on the under side about an inch and a quarter

from the front of the clamps. When did you first notice these tap holes?

A. I never noticed them until they were called to my attention just now.

X-Q. 290. Can you say what is the purpose of these tap holes?

A. I can not.

X-Q. 291. Do you know where the jaws are that were used for butt welding the rings in this machine?

A. I do not.

X-Q. 292. When the machine was used for butt welding the rings, how was a ring placed, forward or backwards or vertical?

A. The large rings were placed backward, as I understand the meaning of this question; and some of the smaller rings were welded in a vertical position.

X-Q. 293. How wide or thick is the piece of red fiber now present between the stationary clamps of this machine?

A. About one-half inch.

X-Q. 294. How wide is each of the pieces of grey fiber between the clamps of the machine?

A. About one-eighth inch.

X-Q. 295. How long is the top side of these pieces of fiber?

A. About two and a half inches.

X-Q. 296. Please measure, as best you can, with a steel tape the distance along the conductor from the face of the stationary jaw to the middle of the strap connecting the two sides of the transformer, at its bottom. I mean the conductor strap, connecting the two sides of the transformer secondary.

A. It is about thirty-six inches.

X-Q. What is the distance between the terminals of the transformer secondary?

A. At the point near the secondary coil the distance is about five and a quarter inches.

X-Q. 298. Please measure the circumference of the secondary conductor, which is composed of strands.

A. About one and seven-eighths inches.

X-Q. 299. What would be the size of a spot weld made by the electrodes now in the machine?

A. Because of the fact that the electrodes now in the machine have blunt points, it is impossible to state the diameter of the welds that would be made by them.

X-Q. 300. The operating end of one electrode is not cut down at all, is it?

A. It is not.

X-Q. 301. And the operating end of the other electrode is very roughly tapered, is it?

A. It is.

X-Q. 302. Can you say by looking at these electrodes whether they have been used for welding or not?

A. As they are positioned in the machine it is impossible to see

the ends clearly. Therefore, I am not able to say whether these electrodes have ever been used for welding.

X-Q. 303. Is there anything about the transformer in this machine to indicate that it has ever been overheated?

A. There is.

X-Q. 304. What is that?

A. The secondary leads. The secondary leads have the insulation burned for over half their length.

X-Q. 305. Anything else?

A. The insulation at the top of the primary coil shows that the transformer has been quite hot.

X-Q. 306. In your direct examination you referred to the fan manufacturing season at the Warren Electric & Specialty Co. In what month of the year did that season begin?

A. It varied somewhat, but as a general thing, began about the first of November.

X-Q. 307. That is, began the first of November, to manufacture fans for the sale in the succeeding year. Is that right?

A. It is.

X-Q. 308. Is that true of the manufacturing season which we have called that of 1901?

A. It may have been later than that.

X-Q. 309. How much later?

A. Owing to the fact that all the material which went to make up a complete fan could not always be obtained in time to begin the season, as early as desired, it was sometimes necessary to use up what material was on hand, and to wait until that necessary to complete the fans had arrived. Therefore, parts of the fans were made up and held in the factory waiting until the material to complete them would arrive. In this particular season, owing to the fact that they were developing a new type of fan, this fan was not completely finished until after the first of the year 1901.

X-Q. 310. What do you mean by "finished"?

A. By a "finished" fan, I mean one completed and ready for shipment.

X-Q. 311. Can you say when the 1901 fan manufacturing season did actually begin?

A. I can not.

X-Q. 312. Can you say that it was before January 1st, 1901?

A. I can.

X-Q. 313. In preparation for the manufacture of these cheap fans, were the spiders and fan blades punched with holes for the rivets by which these parts were secured together?

A. They were.

X-Q. 314. How long did the fan manufacturing season of 1901 last?

A. In general, the manufacturing season lasted until about the first of July of each year. As far as I can recall, this was true of the 1901 fan season.

X-Q. 315. In the 1901 season, when were the first fans shipped?

A. I do not know.

X-Q. 316. What is your best recollection?

A. I have no recollection in regard to it, because the shipping was done in another part of the works, which I visited very seldom.

X-Q. 317. When were the first of the "cheap fans" finished in the season of 1901?

A. In February or March of that year.

X-Q. 318. About how many "cheap fans" were made in the 1901 season?

A. I do not know.

X-Q. 319. What is your best estimate?

A. I am not able to make any estimate as to the number of these fans that were completed. I believe, however, that most of the desk fans manufactured during that season were of the "cheap fan" type.

X-Q. 320. Were there over a thousand such fans made in 1901?

A. I think so.

X-Q. 321. Were there over two thousand of such fans made in 1901?

A. I think it is very likely.

X-Q. 322. As many as twenty-five hundred?

A. I think there was over three thousand made during that season, but perhaps not over four thousand.

X-Q. 323. There were two butt welds made for each fan of this type, were there?

A. There were.

X-Q. 324. In making these butt welds, were the ends of the rings tapered at all?

A. They were not.

X-Q. 325. In your answer to Q. 60, you refer to the use of this McBerty machine, by "the regular operator." Who was he in 1901?

A. By "the regular operator" I meant the man whose duty it was to operate this machine. As I remember it, three men operated this machine during the season of 1901. They were John Gilder, Curtis Brewer, and Charles Colliss.

X-Q. 326. Who operated the machine in 1902?

A. I believe it was operated by the same men who operated it in 1901.

X-Q. 327. Who operated it in 1903?

A. I do not know.

X-Q. 328. Who operated it in 1904?

A. I do not know.

X-Q. 329. These regular operators made butt welds on the machine, did they, to make the rings of the fan guards?

A. They did.

X-Q. 330. There were two such rings in each fan, were they?

A. Yes.

X-Q. 331. What persons did you see using the machine welding blades to the spiders of fans?

A. F. P. McBerty, and E. C. Lipps.

X-Q. 332. Anyone else?

A. Not that I remember of.

X-Q. 333. What was Lipps' job, in 1901?

A. He was employed in charge of the Filament making Department of the Warren Electric & Specialty Co., and also put in a part of his time assisting Mr. McBerty.

X-Q. 334. Do you think that McBerty and Lipps would know more or as much as you, yourself, know about the use of this machine for spot welding?

(Objected to because it is calling for the opinion of the witness as to what others know.)

A. I do not know.

X-Q. 335. When did you see McBerty and Lipps doing this spot welding work? I mean in what years.

A. In the year 1901.

X-Q. 336. Did you see them doing it in 1902?

A. I did not.

X-Q. 337. In what months in 1901 did you see them doing it?

A. In the latter part of January or in February of that year.

X-Q. 338. Any other months in that year?

A. No, sir.

X-Q. 339. Was the machine under Mr. McBerty's control?

A. It was, at that time.

X-Q. 340. Did you save any of the samples of spot welding that you made on this machine in 1901, or thereabouts?

A. I did not.

X-Q. 341. Did you ever see this machine operated at the Warren Electric & Specialty Company with electrodes that were not straight, but were bent up, and then bent again to bring their ends opposite to one another?

A. I never saw it used with such electrodes as those mentioned in the question.

X-Q. 342. Did you ever hear of it being so used?

A. I do not remember of hearing it being so used.

X-Q. 343. In your answer to Q. 67, you referred to Ed Craft, E. C. Lipps, Harvey Eckenrode, John Gilder, John McDonald, and Clyde Storier, as having manifested interest in this welder. What are the last addresses of these persons, known to you?

A. I do not know Ed Craft's address. The last I knew of E. C. Lipps he was in Detroit. I understood he was working for the Packard Co.; Harvey Eckenrode, Elyria, Ohio, Supt. of the Superior Metal Products, of Elyria, Ohio; John Gilder, Warren, Ohio, was employed at the Federal Machine & Welder Co.; John McDonald, Warren, Ohio, employed by the Trumbull Public Service

Co., Warren, Ohio; and Clyde Storie, Youngstown, Ohio, employed by the Miller-Smythe Co., Youngstown, Ohio.

X-Q. 344. What were the jobs of Craft, Eckenrode, Gilder, McDonald and Storie at the Warren Electric & Specialty Co. in 1901?

A. Ed Craft was electrician; John Gilder was a workman in the factory; John McDonald was, at that time, in charge of fan testing; and I believe, also, in charge of the assembling of the fans; Clyde Storie was a workman in the factory.

X-Q. 345. Now, referring to your use of this McBerty machine in 1901, how long did you keep the current on when you made a weld?

A. I should think about three seconds; perhaps a little longer.

X-Q. 346. With what diameter of stock?

A. Quarter inch stock. In the neighborhood of quarter inch. I don't know exactly.

X-Q. 347. Round or square.

A. Both round and square.

X-Q. 348. How long would you keep the current on in making a spot weld?

A. The time varied with the thickness of the pieces and the diameter of the points. The thin pieces, which I welded, could be welded in about one second, or less.

The thicker pieces, such as fan blades, took from two to five seconds. A small point would make a weld quicker than a larger one; that is, a weld one-eighth inch in diameter could be made quicker in the same thickness of material than one three-sixteenths of an inch in diameter.

X-Q. 349. What did you have to do in getting up or preparing either the 1900 catalog, "Exhibit one," or the 1901 catalog, "EXHIBIT two?"

A. Nothing.

X-Q. 350. What did you do towards procuring those catalogs to be used in this case?

A. Nothing.

X-Q. 351. Was there a fan catalog of the Warren Electric & Specialty Company or of the Peerless Electric Company for the season of 1902?

A. There was.

X-Q. 352. Was there any for 1903, 1904 and 1905?

A. I do not know.

X-Q. 353. Were the cuts appearing in the 1901 catalog on page 17 reproduced in the 1902 catalog?

A. I do not know.

X-Q. 354. Now, when were the exhibit photographs of the McBerty machine "C, D and E," made?

A. I do not know.

X-Q. 355. Did you have anything to with making these photographs?

A. I did not.

X-Q. 356. They show the machine in its present condition, do they not, with the exception of the character of the electrodes, and the work?

A. Photographs "C and D" show the machine in its present condition, with the exception of the electrodes, as mentioned, and of the position of the operating levers. "Exhibit E" shows the machine in this condition without holding anything between the electrodes.

X-Q. 357. The photographs, Exhibits C, D and E, show the machine in the present framework, do they?

A. They do.

X-Q. 358. After you left the employ of the Peerless Company in January, 1905, until you saw the McBerty machine, after you entered the employ of the Welding Patents Investigating Committee, in April, 1917, had you seen this machine?

A. I had.

X-Q. 359. When?

A. In the latter part of March, 1917.

X-Q. 360. Where?

A. At the plant of the National Electric Welder Company.

X-Q. 361. Was the machine then mounted as it now is in Exhibit B?

A. It was.

X-Q. 362. When was the last time before January, 1905, that you saw this machine?

A. I do not remember seeing it after the fan motor and transformer business of the Warren Electric & Specialty Company was taken over by the Peerless Electric, about the first of July, 1902.

X-Q. 363. Did you ever see the clamping device of this machine, Exhibit B, fastened to or mounted upon a base of slate?

A. I do not remember seeing it mounted on a base of slate.

X-Q. 364. Did you ever see, at the National Electric Welder Company, or anywhere else, a base of slate on which you understood, that this clamping device had been mounted?

A. I never understood that the clamping device had been mounted on a slate base, and do not remember of seeing it.

X-Q. 365. Referring now to the samples, Exhibit A, what is the thickness of the thin sheet, and what is the thickness of the thicker sheet?

A. I can not say exactly, but I believe the thin sheet to be twenty-nine gage and the thicker pieces to be twenty-four gage.

X-Q. 366. What are the sizes of the weld in these samples?

A. In the samples of the thin sheet the welds are about one-eighth of an inch in diameter. In the thicker sheets, they appear to be slightly more than that.

X-Q. 367. In what month of 1917 did you make these particular samples?

A. In April.

X-Q. 368. Were they the first welding that you did on the machine at the National Electric Welder Company?

A. I do not know. I made several welds in different pieces at that time; and I am not able to state whether these samples were the first I welded or not.

X-Q. 369. How often did you operate the machine to make welds at the National Electric Welder Co.?

A. I suppose I made a dozen or more welds at that time.

X-Q. 370. How many welds did you see Mr. McBerty make at the National Electric Welder Co. on this machine?

A. About the same number, I should think.

X-Q. 371. In making these welds did you use the cam levers to force the clamps toward one another?

A. I did.

X-Q. 372. These are new cam levers that are now on the machine, are they?

A. They are.

X-Q. 373. Did you use the switch that is now on the machine?

A. I did.

X-Q. 374. Was the machine, when you first saw it at the National Electric Welder Co. in the frame, as you now see it?

A. It was.

X-Q. 375. Were the steel spiders and blades of the cheap fan of the Warren Electric & Specialty Company japanned?

A. Some of them were.

X-Q. 376. Were most of them?

A. I do not know.

X-Q. 377. What was the kilowatt capacity of the transformer which you had built for the welding machine for the Carnegie Steel Company at their Ohio works?

A. I used a core of a five kilowatt Westinghouse transformer, but the welder was capable of a greater output than five kilowatts.

X-Q. 378. Was the line voltage delivered to this transformer?

A. Two hundred and fifty volts, approximately. The voltage varied there to a considerable extent.

X-Q. 379. What was the maximum amperage capable of being delivered by the secondary of this transformer?

A. I do not know.

X-Q. 380. Now.

Adjourned at 11:50 until 1:00 o'clock P. M.

Cross-examination closed.

*Redirect Examination by MR. PATTISON.*

Re-D. Q. 380. You have already stated that the "cheap fan" is represented on page 17 of the Warren Electric & Specialty Co.'s catalog for the year 1901. Please state which cut on this page of



the catalog shows the size and type of fan, the blades of which you saw spot welded in January, 1901.

A. The larger cut on page 17, over the letter "G," figure "2," show the fan to which I have referred to as the "cheap fan."

Re-D. Q. 381. And does this cut represent the fan made by the Warren Electric & Specialty Co. in which some of the blades were spot welded in January, 1901?

(Objected to as leading.)

A. It does.

Re-D. Q. 382. How are the blades represented in this cut attached to the spider?

(Objected to as incompetent.)

A. They are welded to the spider.

Re-D. Q. 383. In what way?

A. In spots.

Re-D. Q. 384. Was Exhibit B, the McBerty welder, the only electric welder at the Warren Electric & Specialty Co. while you were there?

A. It was.

Re-D. Q. 385. I call your attention to answer to X-Q. 185, and ask you to explain what you mean by the expression: "The primary connections may not be the same?"

A. By that, I mean that the wire which is at present connected to one of the jaws of the switch may not have been the same primary wire which had been connected to it in January, 1901.

Re-D. Q. 386. Do you know whether the primary connections, as connected in this Exhibit B, are connected as they were in this machine January, 1901?

A. I do not.

Re-D. Q. 387. What is the function in this Exhibit B of the bracket at the upper end of the transformer?

A. Do you refer to the steel bracket at the top?

Re-D. Q. 388. Yes.

A. It is to support the transformer in the frame.

Re-D. Q. 389. Does it have anything to do with the operation of the welder?

A. It does not.

Re-D. Q. 390. You have stated that the clamps at the ends of the transformer core appear to have been put there within the last year or two. Do you remember whether this transformer had similar clamps, when you operated the machine in January, 1901?

(Objected to as leading.)

A. It had similar clamps at that time.

Re-D. Q. 391. X-Q. 250 pointed out to you that the upper lever with the figure 3 on it on the right hand clamp, as facing the machine, did not engage the adjustable clamping jaw. Are you

able to say whether this lever was in its proper place on the machine when that question was asked you?

A. It was not in its proper place. It should have been on the opposite side, as shown by the figure 3 on the lever and on the top of the jaw on the left side of the clamping device.

Re-D. Q. 393. Please state whether in this Exhibit B, with the lever marked with the figure 3, co-operating with the adjustable jaw, figure 3, said lever operatively engages the jaw.

A. It does.

Re-D. Q. 394. Please state whether in this Exhibit B, with the lever having the figure 2 on it, on the right hand side of the clamping device properly and operatively engages the other adjustable jaw.

A. It does.

Re-D. Q. 395. Now, please explain the proper positions on the machine for these two levers, one of which has the figure 3 and the other the figure 2.

A. The lever having the figure 3 should be on the left side clamping device, on the jaw of which is also a figure 3. The lever marked with the figure 2 should be on the right hand clamping device.

Re-D. Q. 396. With these levers in this position, do you move them towards each other or away from each other to cause their cam surfaces to engage the adjustable jaws?

A. I move them away from each other.

Re-D. Q. 397. With this machine, Exhibit B, are these levers fastened on their pivots?

A. They are not.

Re-D. Q. 398. State whether or not they can be readily lifted from and placed on their pivots.

A. They can be.

Re-D. Q. 399. Please state whether or not this construction of the Exhibit B is the same as it was when you operated it in January, 1901.

A. It is the same.

Re-D. Q. 400. On the cross-examination you stated that this Exhibit B in 1901 had several different forms of clamping jaws, some for the butt welding of the guard rings, and some for clamping the electrodes for spot welding. Do you recall whether you removed any of these forms of jaws, and placed the proper jaws on the machine, when you used in January, 1901, for spot welding?

A. I do.

Re-D. Q. 401. You have been asked on your cross-examination several questions, which pointed out tags attached to wires running to the transformer, and based upon the indications on these tags, you were asked several questions. State whether your answers to such questions was based upon an assumption that the tags were correct, or were they based upon your personal knowledge that they were correct?

A. They were based upon the assumption that the tags were properly placed.

Re-D. Q. 402. As a matter of fact, do you know whether or not the tags are properly placed?

A. I do not.

Re-D. Q. 403. Referring to Exhibit A, Smith's samples of welding, of what is the thin sheet metal sample made?

A. It is made of sheet metal steel used in the construction of transformer cords.

Re-D. Q. 404. How about the sample of the relatively thicker sheet metal?

A. They are pieces of scrap fan blades.

Re-D. Q. 405. Referring to X-Qs. 277 to 279, which refer to the 18 inch long wire, connected to the tap at the back of the transformer, can you state whether this wire was connected to the machine in January, 1901, as shown in this Exhibit B?

A. I can not.

*Recross-Examination.*

Re-X. Q. 406. When this machine, Exhibit B, was produced yesterday, the cam lever marked 3 was on the right hand clamp, was it not?

A. It was.

*Re-redirect-Examination.*

Re-re-D. Q. 407. When this Exhibit B was unpacked yesterday morning were the levers in position on the machine?

A. They were not. I placed them on the machine itself, without any reference to their correct positions on the welder.

*Re-recross-Examination.*

Re-re-X. Q. 408. Who fastened the electrodes between the clamp jaws of this machine?

A. I do not know. They were there when I opened it up and took it out of the box.

Deposition closed.

.....  
*Deponent.*

(By Mr. Pattison: The Notary and the witness are requested to initial the exhibits that have been marked for identification.)

Elihu Thomson.

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## UNITED STATES DISTRICT COURT,

EASTERN DISTRICT OF MICHIGAN,

SOUTHERN DIVISION.

HARMATTA PATENT No. 1,046,066—IN EQUITY.

THOMPSON SPOT WELDER COMPANY, PLAINTIFF,

vs

FORD MOTOR COMPANY, DEFENDANT.

Deposition of Elihu Thomson, taken in behalf of the defendant, at the office of Messrs. Fish, Richardson & Neave, No. 84 State Street, Boston, Massachusetts, on the 1st day of July, 1918, before George C. Arvedson, a notary public in and for the County of Suffolk and Commonwealth of Massachusetts, pursuant to the annexed notice.

Present: J. L. Stackpole, Esq., in behalf of Plaintiff. Melville Church, Esq., of Defendant.

ELIHU THOMSON.

ELIHU THOMSON, a witness produced in behalf of defendant, having been duly sworn, deposes and says, in answer to questions propounded to him by Mr. Church, counsel for the defendant, as follows:

Question 1. Please state your name, age, residence and occupation.

Answer. Elihu Thomson; 65; Swampscott, Mass.; Engineer.

Q. 2. You appear here, do you not, in response to a subpoena as a witness in behalf of the defendant?

A. I do.

Q. 3. You are the Elihu Thomson, the patentee of U. S. Patents Nos. 347,140, 347,141, 396,015, 444,928, and 496,019, copies of which I now show you, are you not?

A. I am.

Q. 4. All of said patents and many more relating to the art of electric welding were assigned by you to the Thomson Electric Welding Co., a Maine corporation, were they not?

A. Yes.

Q. 5. When approximately was that company incorporated?

A. Don't remember exactly, but I think about 1888.

Q. 6. Were you an officer or director of that company?

A. Can't say.

Q. 7. What was your connection with that company, if you remember?

A. I had no definite connection so far as I remember. My work has been almost wholly with the General Electric Company in other lines, such as electric lighting, motors, electric railroads, and innumerable other branches of electrical application. The welding matter was somewhat of a side affair, and while I may have been a director of the Thomson Electric Welding Company for a time in those early days, I had no contract with it, I received no retainers from it; subsequent inventions to the original invention were given freely without compensation, as has been the case ever since. Even at the present time I have no very different status in connection with the present enterprises with which my name is connected; I refer to the Thomson Electric Welding Co. and the Thomson Spot Welder Co., of each of which companies I am Vice-President and Director, but rarely have anything to do.

Q. 8. Were you ever a stockholder in the Thomson Electric Welding Co.?

A. Yes, I have been and am a stockholder.

Q. 9. Are you a stockholder now in the plaintiff company, The Thomson Spot Welder Co.?

A. I do not think I have any stock separately from that of the Thomson Electric Welding Co.

Q. 10. Are we to understand, then, that your present connection and interest in Thomson Spot Welder Co. is of the same nature that it has been with the Electric Welder Co. and Thomson Electric Welding Co.?

A. The companies, as I understand, are Thomson Electric Welding Co., the name of the original company; and the Thomson Spot Welder Co., of much later date of organization, the original company being the Thomson Electric Welding Co., organized under the laws of the State of Maine and subsequently transferred to Massachusetts. I have no other connection than what I have stated in answer to Q. 7, with either of these companies. I don't recognize the existence of the Electric Welder Co. as such.

Q. 11. The fact is, however, that your present connection with the Thomson Spot Welder Co. is of the same nature as your connection with the old Thomson Electric Welding Co.?

A. I am a stockholder in one and not in the other, so far as I know; otherwise your statement is correct.

Q. 12. You have taken out at least from 30 to 40 United States patents on improvements in electric welding, all of which have been assigned either to Thomson Electric Welding Co. or Electric Welder Co., or Thomson Spot Welder Co., have they not?

A. Yes, I think that is correct, with emphasis, perhaps, on Thomson Electric Welding Co.

Q. 13. Have you now any connection as expert, engineer or consulting engineer, with the plaintiff company, Thomson Spot Welder Co.?

A. No, except what is entirely voluntary on my part without any retainer or compensation.

Q. 14. Were you present at the trial of the suit brought by Thomson Electric Welding Co. and others against Barney & Berry, Inc., in the U. S. District Court for the District of Massachusetts several years ago, on the Harmatta patent No. 1,046,066 here in suit?

A. Yes, I was present at the request of Mr. F. P. Fish.

Q. 15. Were you examined as a witness for either party at that trial?

A. No.

Q. 16. When did you begin your investigation of the subject of electric welding?

A. That is old past history. The first suggestions of it came to me about 1877. I had no chance to do anything about it till much later, however, but discussed its feasibility and practicability and the forms it would take about 1881 and thereafter until about 1885, when I began the construction of apparatus for welding.

Q. 17. Patent No. 347,140, of August 10, 1886, was the first patent issued to you relating to the art of electric welding, was it not?

A. The first in number; there were three issued together.

Q. 18. You are generally credited, are you not, with being the father of the practical electric welding art?

A. Yes, before the work represented by the original patents there was no such art.

Q. 19. Your patent No. 347,140 describes electric welding as applied to welding of the surfaces of metallic wires, bars, etc.; your patent No. 396,015 describes electric welding as applied to the welding of metallic rivets to metal pieces intended to be united by said rivets, as well as to the electric welding together of such riveted metal pieces themselves adjacent to the rivets; your patent No. 444,928 describes electric welding as applied to the welding of superposed strips, sheets, plates, bars, etc.; and your patent No. 496,019 describes electric welding as applied to the welding of tinned iron plates. Am I not right about this?

A. Not quite right. The statement is fairly correct if it be understood that, in regard to the patent 347,140, the metallic wires, bars, etc., also include objects which may be the subject of butt welding; in regard to patent 396,015, entitled The Method of Electric Riveting, the statement in the first instance is erroneous in not providing for the main object of the patent, which was the formation of rivets in place and the heading of rivets in place by electric heating and upsetting; incidentally to this it is shown that the rivets may be not only dealt with, as is ordinarily the case in riveting, but may be actually welded if desired to and with the body of the plates. The patent 444,928 does describe electric welding of the type of patent 347,140 as applied to the welding of strips by their edges or where they overlap on each; the statement in relation to patent 496,019, as applying to electric welding of tinned iron plates is incorrect, the title of the patent being "electric soldering" dependent on the fusion of the tin coating and not involving any deformation or plasticity

of the plates themselves. This process is not electric welding any more than the use of a soldering iron by a tinman is a welding process.

Q. 20. In all of these patented applications of your electric welding process referred to in my previous questions, as I understand the matter, a welding current is passed through the two metal parts proposed to be joined that are between two electrodes which concentrate the current at the place to be welded, this place being between the electrodes and at the meeting places of the metal parts, and the electrodes first press together the parts to be united to secure a good contact at the place to be welded, and at that place the resistance offered to the passage of the current by the joint between the parts creates such heat that the adjacent metal is fused or raised to a welding temperature and the continued pressure of the electrodes completes the union. Is my understanding correct?

A. I cannot adopt your verbiage in this connection. For example in butt welding, I don't see any electrodes which concentrate the currents at the place to be welded. The clamps are enormously large, and so far from concentrating the current they diffuse it until it reaches the bars which themselves concentrate it. It is the limited size of the bar which causes the concentration and the local heating thereof. Inasmuch as in butt welding the two parts are brought together at a sort of semi-break in the circuit, the greatest amount of this heating is where the bars meet, and the weld takes place there. Otherwise the statement is substantially correct.

Q. 21. In Fig. 13 of your patent 347,140, where there are shown a split ring R whose ends are to be united, and electrodes K K' for clamping such ring ends and bringing them together with pressure and feeding current to them, is not the welding heat relied upon to affect the welding developed by the resistance offered by the passage of the current by the joint J between the ends of the ring?

A. Yes, but in the figure the ring is shown open with the ends not pushed up against each other which would not be the case in actual welding.

Q. 22. In your patent 396,015, you indicate in Figs. 9 and 10 a form of apparatus in which the electric welding current is intended and adapted to be passed not only through the rivet blank itself but also through the pieces or plates to be united; in such an apparatus would not only the rivet be softened and set but the pieces or plates themselves be welded together by the current?

A. I don't think that would happen. The patent says "by the use of this form of apparatus a heating electric current might be passed through the metal plates themselves at parts around the rivet by means of the pressure pieces or clamps K K'. Such current will assist in raising the portion of the plates immediately surrounding the rivet to the welding temperature." This means it would lessen the loss or escape of heat from the rivet itself. I continue the quotation: "but the prime object is that through the application of the pressure the plates themselves may be held together during the riveting. The blocks K' K may therefore be faced with mica or



other insulator  $m\ m'$ ." This means that it may be objectionable to have the current escape laterally and that it had better be concentrated on the rivet itself, while it is needed, however, that the plates themselves be held closely together so that a good job of riveting may be accomplished, or that no metal of the rivets should spread between the plates. The statement is an unimportant one and I have explained how it came to be there.

Q. 23. The portion of the specification which you have quoted is part of the description of the form of apparatus shown in Fig. 9 of the patent. In such apparatus pieces of mica or other insulation lettered  $m\ m'$  are provided. Suppose those insulating pieces  $m\ m'$  were omitted from that apparatus; would not the current pass through the plates or pieces  $P\ P'$  from the electrodes  $K\ K'$  as well as through the rivet blank?

A. No, not necessarily; that would depend on the pressure of the contact which would be very high in the case of rivet blanks and comparatively much less in the case of plates; in fact, if the plates were not cleaned the rivet blanks might possibly take all of the current. Thus in Fig. 10 the insulating mica pieces are not shown; it is not necessary. The pressure of the piece  $K^2$  evidently is much less than the pressure of the plunger which it surrounds; and besides, the plunger has only a sliding fit which is not a good contact for carrying the welding current, a close, tight contact being needed. Then again, in case the pieces  $K\ K'$  were made of copper and the plungers which head the rivet were not made of copper, no complete diversion of current could take place; and if the pieces  $K\ K'$  were of iron, and the plungers which did the heading were of copper, only a moderate current would pass by the blocks  $K\ K'$ . So that the operator has in such a device the whole matter of distribution under his control according to the construction adopted.

Q. 24. I find on page 1 of this patent 396,015 this statement: (line 22) "The heating of the rivet when in position may be carried only to the point sufficient to permit it to be set by swaging or heading its ends, or the current may be allowed to pass for a longer period and until the central portion of the rivet, as well as the metal near thereto, is raised to a welding temperature, when the application of pressure expanding the rivet in its seat weld the same to the metal surrounding it, and the application of pressure to the pieces to be riveted will weld them together around the rivet. In some cases I may cause the electric current to flow across from piece to piece of the parts to be riveted as well as through the rivet itself." Does not this quotation indicate an intention to pass current, not only through the rivet but through the pieces themselves in some cases?

A. Yes; it can't be avoided in any case. As soon as the rivet head spreads over the plates the communication is made to the plates and they are involved in the passage of current. For, as is well known when two or more paths are open to a current, the current divides unless special insulating methods are employed to prevent; and moreover, as the body of the rivet is very much hotter than the



plates, the resistance of the plates for any length is very much less than in the rivet; so that an unavoidable shunting must take place.

Q. 25. And the result of that shunting of current through the plates will result in the welding of the plates themselves, will it not, as expressed in the portion of the specification to which I have directed your attention?

A. It might if sufficient in amount of diversion to the plates.

Q. 26. Is not the idea of welding the plates themselves together also given expression in the sixth claim of this patent, which reads as follows:

("The herein described method of fastening two pieces of metal together, consisting in passing a heating electric current through a rivet or rivet blank, passing through the pieces as well as through the pieces of metal themselves in the neighborhood of the rivet, and applying pressure to set the rivet and weld the pieces together.")

A. Undoubtedly that is one of the objects of the patent as clearly shown in Figs. 6 and 7, not only to heat the rivets, but in some cases to allow the current to heat the plates so that they might be involved with the rivet in a weld.

Q. 27. Did you ever, prior to the date of the application for this patent 396,015, attempt an application of your riveting process in which current was passed, not only through the rivet but through the pieces to be united also so as to weld the pieces together?

A. That is impossible to say now, whether such a thing was done just prior or just when, but I have made such rivets

Q. 28. In your patent 444,928, in describing the operation of the apparatus shown in Fig. 1, you say: (line 78, page 1)

("In this figure I have illustrated the application of my invention to the welding of the edges of two plates M M' together, the plates being shown in end view as in position between the rolls ready to be fed between them in the longitudinal direction of such plates. The edges are slightly over-lapped, as shown, and the plates, being in position between the rolls, may be squeezed together by means of the screw S, thus forming an electric contact between them. The electric current being now turned on as it passes from one roller to the other and across the point of pressure will heat the work to the welding temperature and soften the same slightly, after which the screw may be driven a few more turns to effect a solid union. The work, having been thus started, may now be moved along through or between the rollers, so as to bring successive parts of the joint into position to be pressed and heated at the same time.")

What kind of a weld, if any, would be produced between the plates according to this described mode of operation before the movement of the plates through between the rolls began?

A. A corner weld, the beginning of the seam. The process is in extensive use.

Q. 29. How would that corner weld, as you call it, differ from a spot weld if the welding operation were carried no further—I mean if no attempt were made to weld a seam after the making of the corner weld.

A. It would involve the whole of the overlapping metal of the strips; the strips would be crushed down at that point and spread at the corner and the weld would not be technically like a spot weld, which involves the pressing down at a distinct spot, the localization of the heating by the current at that spot, and the support of the metal at the spot by the surrounding metal so that the surfaces in union are not spread out or extruded to any appreciable degree.

Q. 30. Would it be possible to perform spot welding, as you understand it, by the use of roller electrodes adjustable toward and from each other upon interposed metal plates?

A. Yes; just in the same sense that it would be possible to perform spot welding with the apparatus of say Fig. 1 of patent 347,141; but far more effectively could it be done with this last mentioned apparatus than with any roller scheme which would be wrong altogether. If the pieces  $W W'$  in the Fig. 1 referred to were solid bars of copper slightly tapering at the ends and they were separated, pieces of sheet metal interposed, overlapping, and the pressure was sufficient and the current sufficient, a real Har-matta spot weld might be made. Now roller contacts, unless they dig into the metal, are line contacts; a single line where the curve of the roller meets the flat of the metal, by no means so excellently adapted as the slight modification of the figure which I have referred to; the whole point of the matter is the conception of the Har-matta spot weld having existed or not having existed. The thing is a process and not an apparatus.

Q. 31. Could or could not spot welds be made today by means of an apparatus such as shown in your patent 444,928 where adjustable roller electrodes are disclosed?

A. It will be noted that in the patent referred to there are several figures. In Fig. 1 the rollers overlap the joint to be made very considerably up and down, so that the joint only occupies a small portion of the length of the roll. It is evident that this length of roll might be many times what it is in this figure and not change the relation of things as they are in that figure, so that the question does not really suit the case.

Further, turning to Fig. 4, the rolls are extended to contact the plates on each side to make an edge weld; and in Fig. 5 the rolls are divided and are different, top and bottom, the parts of contact not being even opposed to each other. So that I can see no particular reason why this device should be selected as an apparatus for producing spot welds any more than other figures I have pointed out, and no doubt I could point to many other figures in various patents which with equally slight modifications were well adapted to make spot welds.

Q. 32. With the roller electrode apparatus shown in Fig. 1 of your patent 444,928, would it not be possible to make spot welds on overlapped or superposed plates placed between the rollers—I mean not only one spot weld but a succession of them, with intervening areas of no weld?

A. The question seems to me rather incomplete because it does not state anything about the changes to be made in the disposition of the plates themselves with respect to the rollers. In Fig. 1 it will be noted that the weld to be made is very much narrower than the longitudinal extent of the roll, which, as pointed out before might be made of indefinite extent, without changing the operation for which they were intended. So that if I must assume in answering the question that the rolls are applied and are of such limited extent as to cover a portion only of the overlapped surfaces, it would be proper to answer the question yes; but, that such an apparatus would be by no means as good as the other devices which I pointed out in preceding answers. What in other words would be the object of the rollers which only give a line contact when, if you are making spot welds, you can have so much better a device without rolls? In other words, I regard the question itself as somewhat far-fetched.

Q. 33. You are willing to concede, however, that spot welding may be done by roller electrodes and that the mere fact that roller electrodes give a line impression does not operate to prevent them from producing spot welds?

A. The line impression doesn't help them in the least; it is a disadvantage; and while I might drive a nail with a heavy beer bottle, I prefer a hammer. The whole thing rests on the existence of the conception of a spot weld, and I see no reason for denying the fact that many pieces of apparatus may be so modified or so used as to produce an approximation to the spot weld and under limitations which I think I have made clear. I am willing to concede that a roller apparatus might be one of these various appliances. But, as I said before, I might take many patents showing many electric welding apparatus and point out modifications which would make it possible to make spot welds, and I can't see any particular reason why rollers should be preferred.

Q. 34. In the form of apparatus shown in Fig. 1 of your patent 444,928, only those parts of the surfaces of the rollers lying immediately back of the overlap or joint pass the welding current through the joint: am I not right about this?

A. Of course the contact, or the part where the rollers and metal press against each other, carry the current, and only those parts. I mean of course so far as the work pieces are concerned.

Q. 35. Isn't it true that only those parts of electrodes which lie immediately behind the contacting parts of the pieces to be united pass the current through the pieces to form the weld?

A. All the metal surrounding the contact contributes to the conduction because the current flows along and then in at the joint. It is much the same as if we put a hole in the bottom of a tank contain-

ing water; the flow of water will reach the hole, and not only goes straight down but along the bottom, the sides and in every way moves toward the outlet and the statement in the question would be true only of a very thin layer of the surface of the roll.

Q. 36. Isn't it true that only those parts of the surfaces of electrodes which lie immediately behind the contacting surfaces of the pieces to be united pass the current through the pieces to form the weld?

A. Yes, that is true; the current leaves the roll by those surfaces and enters by those surfaces.

Q. 37. Your company has manufactured and sold or leased for use electric welding apparatus employing roller electrodes, has it not?

A. I don't recall any cases especially.

Q. 38. You have seen such apparatus, haven't you?

A. Yes, I have seen it in use, and it has been experimented with to a considerable extent. As to the facts called for by the question I have no present information. I do know this, that there was a long period of years—just when the limits might be set I do not recollect—during which although efforts were made to introduce roller welding, there seemed to be no takers, so that the patent 444,928 may be said to have been lying without utilization.

Q. 39. But roller welding as a practical matter did arrive many years ago, did it not?

A. Well, there has been a form of roller welding which has been very extensively used. I refer to the making of seamless pipe, in which the edges of the skelp are progressively welded in passing between current carrying rolls, the edges being butted, not overlapped. In a sense the arrangement is akin to Fig. 4 in patent No. 444,928; that has been in extensive use in making pipes, tanks, etc.

Q. 40. In your answer to Q. 29, you implied that in the making of the corner weld, as you have termed it, there would be extrusion of metal. What did you mean by that?

A. I meant the same action that occurs in butt welding—the spreading of the metal at the weld where it is so soft that unless there is resistance to lateral flow, it moves in the line of least resistance.

Q. 41. Are you prepared to say that there is no extrusion of metal at all, in the sense in which you have used that term, in the making of spot weld, so-called?

A. There is a slight movement of the metal but it is not manifested as an extrusion. The plates appear after the welding slightly indented or practically flat. The indentation, of course, means that the metal has moved, but practically all of the metal is included in the weld, framed around by the unwelded material which being on edge opposes a very high force in the spreading.

Q. 42. Is that true whether the plates being welded have both of them plane surfaces or one a plane surface and the other a small projection at the point where the welding takes place?

A. In what is known as projection welding, still another form of welding, the projection itself is crushed down, and in sheet metal the place of the projection is the place of the weld. If the projection is made, as is often done by punching or pressing one of the pieces so as to form a projection from the back, leaving a hollow back of projection, the welding tends to fill this hollow and flatten the whole thing. In this case, the extrusion, if such occur, is backward into the plane of the plate, mostly.

Q. 43. In projection welding where projections are formed on the plates otherwise than by punching from the rear of the plates, is there any extrusion of metal during the welding operation?

A. There is a spreading of the projection and an enlargement of the section of the weld; but the term "projection welding" has been used so loosely, to cover such a variety of cases, that I shall have to ask counsel to point out just what he means or I shall have to catalog the whole list of these forms.

Q. 44. In my last question I had in mind the welding of plates provided with projections such as shown in Figs. 3 and 4 of the Rietzel patent 928,701. With this limitation I ask you if there is what you call extrusion of metal in the welding together of such plates, according to the method of Rietzel.

A. Yes, there naturally would be extrusion as each one of the welds is plainly like a small butt weld, but I do not know that that method has been practiced in contradistinction to the other methods shown in the same patent, which have been extensively practiced.

Q. 45. Did you ever place or see placed superposed plates of metal between the roller electrodes of an electric welding machine and make or see made a weld by pressing the work between the electrodes and passing a welding current through the work while the pressure was continued; and if so, when first?

A. If the question means to inquire when I saw a roller welding machine for continuous seaming used without making a continuous seam, I would say I have never seen it. If it means with the making of a continuous seam, then I should like to be informed.

Q. 46. Does the question not describe the making of what you have characterized as a corner weld with a machine like that of your patent 444,928?

A. We never made corner welds except at the beginning of a seam, and then of course they were no longer corner welds but continuous with the seam. If counsel means to draw a line between a corner weld and that which follows it, I haven't any sympathy for the situation at all.

Q. 47. With apparatus such as shown and described in your patent No. 444,928, could you not fasten two pieces of metal together by electrically welding them to one another at spots only of their juxtaposed or opposite faces by the application of pressure and heating current localized in such spots?

A. Yes, just as I said it could be done better with many other devices which wouldn't have to be modified as much, all of which existed in the electric welding art many years ago.

Q. 48. Would not the product resulting from the practice of the method of use of the apparatus of your patent No. 444,928, set forth in the last question, exhibit an area of no weld around each of the welded spots?

A. Of course if an apparatus was modified to produce Harmatta spot welds it would produce them and they would have the characteristics of such welds. I have already made it clear that I do not consider that the particular apparatus as 444,928 is anywhere near as well adapted to produce Harmatta spot welds as much other apparatus forming the subject of other patents taken out at various times by myself and others. I am interested merely in having the plain truth of this matter understood, namely, that with any apparatus which produced Harmatta spot welds the products resulting would exhibit an area of no weld around each of the welded spots.

Q. 49. As I understand it, in the practice of the method of uniting tin plates by the use of the appliances shown in Figs. 4, 5 and 6 of your patent No. 496,019, the two parts or pieces P P' to be united are pressed together flatwise by the electrodes C C' and current is then passed through such parts until the tin coatings of their approximate surfaces are fused or welded by the heat generated between such surfaces. Is my understanding correct?

A. It is, except that we do not technically call such a joint a welded joint, since the complete liquefaction of the more fusible tin coating is the cause of the union.

Q. 50. The surfaces of the plates or parts united by heat and pressure according to the disclosure of Figs. 4, 5 and 6 of this patent 496,019 are surrounded by areas of no union, are they not?

A. As I have said the process is a soldering process, and of course if any parts are not soldered they are outside of the soldered area. Such pieces when stripped away from each other tear apart just as two soldered joints tear apart and the two original pieces are not joined in any sense by welding.

Q. 51. In the form of apparatus shown in Figs. 21 and 22 of your patent No. 496,019, the pieces to be united are represented as consisting of plates superposed flatwise and electrodes C C', through which pressure and current are applied, are shown of as less facial area than the area of the superposed parts of plates, are they not?

A. Apparently so, but I would say for the benefit of counsel the letter P, meaning the work in all these cases, merely relates to pieces shown in Figs. 1, 2, 3, 4, 5, 6, etc., to avoid the necessity of drawing in details in such Figs. as 21 and 22. No importance is to be attached to this or the details of these figures. They are all solderings and there is no more reason for referring to these Figs. 21 and 22 than to Fig. 1 or Fig. 4.

Q. 52. The use of the apparatus shown in such Figs. 21 and 22 would result in the production of united superposed plates having an area of no union surrounding the area where union has been effected, would it not?



A. Yes, and if shellac had been used instead of tin to unite the pieces, the same would have been true, except that instead of calling it solder we should have then called it cement.

Q. 53. In the use of the apparatus shown in Figs. 21 and 22, of this patent 496,019, if sufficient current were employed, not only would the tin coating on the superposed metal plates be fused but the plates themselves would be fused or welded together, would they not, according to the laws of electric welding well known at the date of this patent, 496,019?

A. If the assumptions of the questions were carried into practice, the pieces would be spoiled in that operation. The particular feature of this operation of electric soldering, is that the pieces themselves undergo no deformation of any kind. It is a pure gratuity to assume that such a thing as has been assumed is possible. I could read out of the patent many things which absolutely deny any such contemplation. I call attention to Figs. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, as absolutely denying the situation which is supposed to be possible by the question with this arrangement. In Fig. 7 the electrode pieces are faced with carbon. Any very moderate current would heat this carbon to redness and cause its combustion long before the work could be brought to welding surfaces. Then look at the facets and cut faces of the electrodes in Figs. 8, 9, 10 and 11, and again notice the pin-like projection in Figs. 12 and 13; and further, the serrations in Figs. 14, 15, 16 and 17; and again the formation of the electrode surfaces in Figs. 18, 19 and 20. Such surfaces would of course break down under a heavy current and flatten right out. So that, there is no question in my mind that it is the merest gratuity to assume a condition for which this invention was never in the slightest degree intended—and having made the invention, I ought to know.

Q. 54. I shall have to ask you to answer my question.

A. Counsel has apparently forgotten that the patent to which he refers, No. 496,019 refers to a definite apparatus, absolutely incapable without extensive modifications of being used in any such way as he has assumed. Why not assume at once a Harmatta spot welding machine and have done with it? Why try to use a patent which has no relation whatever with welding and which certainly nothing to do with spot welding. It's a cementing machine requiring only very moderate currents and very moderate pressures and making only very moderate unions. For example, on page 2, line 4, in regard to the use of a flux:

"Slightly oiling the cementing surfaces with lard oil or other stearine containing oil will easily suffice when the pieces P P' are tin plate."

"My present invention relates to an improved method of producing soldered joints between metal pieces, and is particularly applicable to soldering sheet metal pieces flatwise. When applied to tin plate the tin itself which covers the iron plate is

often sufficient for the uniting solder. In other cases solder may be applied."

Besides these quotations tending to show what the patent is really for, I will also add this one which clinches the matter:

"My invention comprises further an improvement in electric soldering consisting essentially in establishing an electric resistance to the passage of the current from the clamp or pressure block back of the joint to the metal or the work to be joined. This may be done either by modifying the surface of the pressure block itself or by modifying the surface on which it bears, or both, or by the interposition of a thin septum, layer or zone of resisting material, or material modified in condition or form so as to oppose a resistance to the passage of an electric current. Some of these means for establishing a resistance are hereinafter more particularly described."

This last quotation calls attention to the fact that an electric resistance is established back of the joint to be made—that is, in the electrodes, stating the means to be used, having relation to such figures as I have referred to, 7 to 20. Now, inasmuch as tin melts very readily, it is perfectly safe to put resistance into the electrode faces to generate heat which never need be so high as to cause destruction or deterioration, inevitably the case if a very heavy current were used.

Q. 53. Will you now please give me, if possible, a relatively short and concise answer to my last question?

A. I will. The apparatus of Figs. 21 and 22 of patent 496,019 is no good for electric welding.

Q. 56. You still haven't answered my question.

A. I think I have. You have asked me about a particular apparatus and the use of it; you said actually "in the use of the apparatus shown in Figs. 21 and 22, of this patent 496,019, if sufficient current were employed," when the fact is that no sufficient current could be employed in that apparatus. If you were an electrician you would know it from the look of the apparatus. The apparatus would burn up; in fact I may add, that the arrangements for passing current and the volume of current are in no sense suggested for welding. That is the reason I have been unable to answer, as Counsel thinks I ought to have done, and that is the reason, too, that I have said the whole thing is a mere gratuity to make such an assumption.

Q. 57. At the date of this patent 496,019 was your knowledge of electric welding so limited that you did not know that plates of metal superposed flatwise could be welded together at their proximate faces by the pressure of current carrying electrodes?

A. Nobody ever suggested it; it was never discussed.

Q. 58. Do you wish to give the impression that you, the father of



the electric welding art, did not at the date of this patent 496,019, know that superposed flat plates could be thus welded by the pressure of current-carrying electrodes?

A. I suppose in answering the previous question that what is referred to is what is now known as the spot weld. I notice the question is really broader than that and perhaps I should not have answered it so briefly. I will say that while we knew that overlapped plates pressed between electrodes might be welded, it had never occurred to me nor to others with whom I was associated to make what are called spot welds, that is, local spots of welding by electrodes narrowed down at the ends and of high conductivity metal pressed towards each other with sheets overlapping between, localizing the work of the weld to only a portion of the immediate surfaces.

Q. 59. May I ask you to give a clean-cut definition of what you call spot welding?

A. I understand by a spot weld a weld applied to plates or more particularly to sheets of very moderate thickness possessing themselves a certain amount of flexibility, such weld being produced by pinching the parts of the sheets at a spot surrounded by metal not so pinched, passing a current of sufficient amount to suddenly heat the meeting sides of the sheets up to welding temperature, such current entering through the electrodes which are naturally of high conductivity metal at least through the most of their length and narrowing near the work to faces which constitute the area of the spot. On account of the cooling effect of the electrodes and of the surrounding metal about the spot, the highest temperature naturally is reached where the sheets come together; it is local to the meeting sides of the sheets, the pressure causing union or true welding, which may be defined as a true interlocking of the molecules when the metal is plastic. The cutting off of the current and the removal of the electrodes leaves a visible spot slightly depressed, it may be, and but little deformed externally for an ideal case. It will be evident that under the conditions the plastic metal, being as it were supported or framed in edgewise or laterally, cannot flow away.

Q. 60. How large may a spot weld be; how large a spot weld have you ever seen?

A. I have seen spot welds that were about an inch in diameter, the very largest. How large they may be is another question. I myself have a theory that if the scale of operations were multiplied by some factor in every way, we might have spot welds of very large size; I mean by this that given a certain size weld, a certain thickness of metal, a certain extent and overlap of sheets, and so on, we might use the factors for multiplication, say 100, and have a spot weld 100 times as big in every way. In other words, we might look at our small weld with a magnifier which magnifies it 100 times. As a matter of practice, however, we have no need to consider such magnification; the field is very definite and is gen-

erally limited to small thicknesses of sheet metal; and difficulties arise in larger work because all the conditions cannot be magnified by the same factor.

Q. 61. In your definition of spot welding what is the limit as to the thickness of the plates to be united? Must they necessarily be very thin or may they be thick and inflexible?

A. They should be flexible. Where they are thick they need enormous pressure to bend them to meet; but where they are too thick and not very true in surface they generally make contact at the wrong spot before the electrodes force down the metal at the contact; but that is a limitation of apparatus, probably. I have seen good spot welds not too near together on extended sheets up to  $3/8$  thickness, the spots themselves being probably  $3/4$  of an inch in diameter or more. Such work is difficult and the real practical work is with the thinner metal.

Q. 62. What is the greatest thickness of sheets you have seen spot-welded?

A. I have seen sample plates up to  $1/2$  in. or more, with an area of about an inch; but I have my doubts as to the entire practicality of such heavy work.

Q. 63. What extreme thinness of plates may be spot-welded?

A. I haven't tried, but I think there is scarcely any limit.

Q. 64. What is the extreme limit as to thinness that you have seen tried?

A. It is impossible to say; I have seen metal used not more than  $1/50$  of an inch.

Q. 65. Now, Professor, when did you first discover or learn that spot-welding, as you have defined it could be practiced?

A. That is hard to say; certainly not before I heard of the Harmatta application being on file in the U. S. Patent Office through interference declared with pending application.

Q. 66. With whose pending applications?

A. I believe Rietzel's.

Q. 67. There was an interference declared between Rietzel's patent issued July 20, 1909, and the application for the Harmatta patent, but this interference was not declared until April 26, 1910, as appears from the certified copy of declaration now before me. Can you say that you had never heard of spot-welding before the year 1910?

A. No, I don't think I can. I know nothing about these details which you are asking about now. It would be a mere guess even if I should attempt to answer.

Q. 68. You can at least tell me where you first saw a machine designed and intended for the practice of spot-welding, can't you?

A. Not absolutely, but I think it was at the Thomson Electric Welding Co. at Lynn.

Q. 69. And you can tell us where you first saw a spot welded article, can you not?

A. No, I cannot.

Q. 70. Didn't the Thomson Electric Welding Co. put out spot

welding machines designed and intended for spot welding as early as the year 1905?

A. I don't remember that they did. And I want to say in explanation, it might be assumed by the question that I was in close touch with the business of the Thomson Electric Welding Co. This has not been the case since the early days, and even then my time was given mostly as it has been ever since, to the work of the General Electric Co., the range of whose work is enormously great.

Q. 71. Is it not the fact that the Thomson Electric Welding Co. constructed and marketed, or at least leased, spot welding machines for making what you have defined as spot welds before it had knowledge of Harmatta or his application?

A. I don't think so; I don't remember so. Mr. Rietzel was working on projection welding quite early, but that was different, though I wouldn't undertake to say just when his work was done or when the machines were marketed. This is explained by the fact, as pointed out before, that I was not in steady touch with what was going on at the welding company, my time being taken up in many other directions.

Q. 72. You are not sure that you got your idea of spot welding originally from Harmatta or his application, are you?

A. Oh, yes, I am sure. That is exactly the point. I was very much surprised when I first learned of Harmatta that we had missed in our development such a simple and beautiful application.

Q. 73. You would now be surprised if it should transpire that your company, as well as other concerns in this country, had built and operated spot welding machines without any knowledge whatever of Harmatta or of his application for patent, would you not?

A. I should want to find out about it, I should want the truth and all the circumstances; it might be even a question of interpretation which I am not willing to assume on the strength of counsel's statement.

Q. 74. Wherever you got your idea of spot welding as you have defined it originally, you are of the impression that it was from someone connected with the Thomson Electric Welding Co. Am I right about this?

A. Yes.

Q. 75. Your original patent of 1886, No. 347,140, covering the art of welding, did not expire until the year 1903, did it?

A. It ran 17 years.

Q. 76. Up to the time of the expiration of that patent, the Thomson Electric Welding Co. made and leased machines under that and other patents of yours, did it not?

A. Yes.

Q. 77. The policy of the company was not to sell but to lease machines, was it not?

A. Yes; the first arrangement was to endeavor to collect royalty on the welds made, which after all was the only just way because the invention was not simply the machine, but the welding itself

was the novelty to be charged for; but it was found practically impossible to get any proper return that way, and the leasing plan was finally adopted, and largely on account of the fact that it had worked well with other organizations, that the business was a special one and the machines were special and oftentimes very expensive in working out.

Q. 78. It was a customary provision in those leases put out by the Thomson Electric Welding Co., authorizing the use of electric welding machines to require the lessee, with knowledge of and to agree not to contest the validity of any of the patents comprehended by the lease during the life of the patent which had the longest term to run, was it not?

A. I think you are right; I have not read the lease for so long time that I cannot guarantee the provisions. It was a matter in the hands of counsel.

Q. 79. Before the expiration of your original patent—I mean the fundamental patent of 1886—the art of electric welding had advanced by leaps and bounds, had it not?

A. It was very uphill work in the early days to get people to even take hold of the new process, one of the chief reasons being that electricity was not on tap, as it is today, everywhere, and its introduction meant oftentimes a special power plant: many of the users regarded it as a kind of experiment and did not want to go to that expense.

Q. 80. By 1905 the employment of electric welding had become quite general and other concerns beside the Thomson Electric Welding Co. began to put out electric welding machines, did they not?

A. No, I don't think they did; very few.

Q. 81. Well, four or five, certainly?

A. I think the statement rather exaggerates the conditions. As I said before, the business did not go on by leaps and bounds; it was comparatively slow in the early days, and that might have been true up to 1905, considering the enormous range of metal manufacture to which it was possible to make application of it.

Q. 82. There is a good deal of electric welding done today that is not spot welding, according to your definition, is there not?

A. There is, certainly. And in the earlier days there was a good deal done because one machine would do a great lot of it in a year.

Q. 83. Will you mention some of the special applications of electric welding other than spot welding that exist today?

A. Butt welding is used in wire work of all kinds; it is used in building parts of machine tools like drills, reamers, etc.; it is used in modified form for metal tires ranging from baby carriage tires and toy vehicles up to automobile rims and heavy truck rims, which is the largest work of the kind; it is used in repair work, replacing worn parts of tools; it is used in many metal manufactures which I do not need relate at present; seam welding used in tanks and bath boilers, containers; then there is the longitudinal seaming of steel tubing which has developed considerably; automobile parts,

casings for gears, and the like, butt welding; electrically welded wire fencing, and many others.

Q. 84. Has not this extension of butt welding and seam welding, and other kinds of welding besides spot welding been influenced by the general prevalence and availability of current?

A. Yes, that has helped very much and also the fact that utensils of steel are more common than formerly.

Q. 85. And has not the extension of electric welding of all sorts been due to some extent to the running out of the dominant patents issued to you and to others owned by Thomson Electric Welding Co.?

A. I must confess I cannot estimate how much influence that has had.

Q. 86. Do you regard it as essential that electrodes used for spot welding be tapered or reduced toward their contact faces? Cannot cylindrical or square electrodes of uniform dimensions throughout be successfully used for spot welding?

A. It simply amounts to this: that the cylindrical electrode breaks down or spreads at the edges and becomes convex through use, in which case it may be said to have tapered itself. For such a soft metal as copper it is well to have the electrodes cooled, especially at the tips, and it is conducive to this cooling to make the body a little away from the weld larger, as by tapering at the end and this ought to be done very abruptly for the best results. The heat is not only carried off better, but the resistance of the electrode of lower temperature is less and the section for carrying the current is much larger right up to the weld; all of which is electrically sound; inasmuch as we do not want to waste energy in heating the electrode itself but only the weld. I have even known steel electrodes very blunt and water-cooled to have been used successfully. When I say water-cooled I mean cooled by internal circulation of water right down to the end. There is nothing essential in the form, in view of the fact that I have pointed out that the wear tends to convex the electrode.

Q. 87. Wear tends to convex the contact surfaces of electrodes that are tapered, does it not?

A. Nothing like so much and nothing like so soon.

Q. 88. In practice, are not even tapered electrodes required to be frequently repointed, so to speak, by filing, or otherwise?

A. Yes, usually being made of copper or soft metal, they need redressing.

Q. 89. With what sort of metals have you dealt in the production of electrodes for spot welding machines?

A. Mostly copper and bronze; not myself, because I haven't done much of that work.

Q. 90. Tungsten, being of relatively high conductivity and low resistivity, would answer well and might be used were it not so expensive, am I right about this?

A. Yes; I have known of its being used in special ways and in special cases, and with considerable success.

Q. 91. How about iridium; might not that be used but for its high cost?

A. It is not as good a conductor as we could wish, and the cost is about \$175 an ounce.

Q. 92. But you think it might answer for an electrode for a spot-welding machine if the cost were not too high?

A. It might if it did not have so high a resistance which would waste energy; I don't think anybody is likely to try it.

Direct examination closed.

*Cross-examination by MR. STACKPOLE:*

X-Q. 93. You have been asked concerning your patents No. 347,140, 347,141, 396,015, 444,928 and 496,019. Do any of these patents describe the Harmatta process of spot welding?

A. Certainly not.

Deposition closed.

Adjourned until further notice.

ELIHU THOMSON.

State of Massachusetts, County of Suffolk, ss.:

I, GEORGE C. ARVEDSON, a notary public within and for the Commonwealth of Massachusetts, duly commissioned and qualified and authorized to administer oaths and to take and certify depositions, do hereby certify that, pursuant to the annexed notice issued and served in the civil cause pending in the United States District Court, for the Eastern District of Michigan, Southern Division, wherein Thomson Spot Welder Company is plaintiff and Ford Motor Company is defendant, I was attended at the office of Messrs. Fish, Richardson & Neave, 84 State Street, Boston, Massachusetts, by J. L. Stackpole, Esq., counsel for said plaintiff, and by Melville Church, Esq., counsel for defendant, on the day hereinbefore stated, to-wit, on July 1st, 1918; that the aforementioned witness, Elihu Thomson, who was of sound mind and lawful age, was by me duly sworn to testify the truth, the whole truth, and nothing but the truth, and he thereupon testified, as is shown in the foregoing deposition annexed; that the said deposition was by consent of counsel reduced to typewriting by Blanche Levy, in the presence of the witness himself and from his statements and in the presence of said counsel for said parties at the place indicated and at the time set forth; that by agreement of counsel the testimony was taken partly in my presence and partly during my absence; and that the said deposition was duly signed by the said witness.

I further certify that the reason for taking said deposition was and is, and the fact was and is that the said witness lives more than one hundred miles from the place where the said civil suit is

appointed by law to be heard; that I am neither of counsel nor attorney for either of the parties to the said suit, nor interested directly or indirectly in the event of said cause; and that by agreement with counsel the said deposition has been by me delivered to counsel for defendant with the understanding that he is to deliver it into the custody of the Clerk of the Court before trial.

WITNESS my hand and seal at Boston, Massachusetts, this eleventh day of July, 1918

GEORGE C. ARVEDSON,  
*Notary Public.*

(Seal)

My commission expires Sept. 25, 1924.

UNITED STATES DISTRICT COURT.

EASTERN DISTRICT OF MICHIGAN.

SOUTHERN DIVISION.

IN EQUITY.

THOMSON SPOT WELDER COMPANY, Plaintiff,

*vs.*

FORD MOTOR COMPANY, Defendant.

HARMATTA PATENT No. 1,046,066.

Deposition of Frank L. Dyer, taken in behalf of the defendant, at the office of Messrs. Church & Church, 908 G Street, N. W., Washington, D. C., on the 22nd day of July, 1918, before Thomas Durant, a notary public in and for the District of Columbia, pursuant to agreement.

Present: GEORGE C. ARVEDSON and J. L. STACKPOLE, Esquires,  
for the Plaintiff.

MELVILLE CHURCH, Esquire, for the Defendant.

FRANK L. DYER.

FRANK L. DYER, a witness produced in behalf of defendant, having been duly sworn, deposes and says, in answer to questions propounded to him by Mr. CHURCH, counsel for the defendant, as follows:

Question 1. What is your name, age, residence and occupation?

Answer. My name is Frank L. Dyer; my age is 47 years; my residence is Montclair, New Jersey; and I am at the present time engaged in the manufacturing business, although I am frequently



consulted as an expert in matters relating to patents and have occasion frequently to testify as such in patent suits.

Q. 2. What have been your educational advantages, training and experience qualifying you in your judgment to testify as an expert in relation to the art of electric welding?

A. For upwards of thirty years I have given very close consideration to matters relating to inventions. I practiced actively as a patent lawyer and solicitor up to the year 1908, and during that time had occasion to prepare and prosecute in the Patent Office several thousand applications for patents relating to many diverse arts, including electrical inventions of various kinds. From the year 1897 to the year 1908 I prepared all of the applications for patent of Thomas A. Edison and during most of that time I was the general counsel for Mr. Edison and the various corporations which he had formed at Orange, N. J. From the year 1908 until the end of 1912 I had general executive charge of these various Edison Companies, devoting my time very largely to commercial and practical manufacturing considerations, and since then my time has been largely occupied in connection with manufacturing questions. From the year 1903 until the end of 1912 I was located at Orange, N. J., in practical daily touch with Mr. Edison, and familiarized myself with his methods of experimenting and carried out on my own behalf many experiments myself. This was a very illuminating experience. I am associated with the American Institute of Mechanical Engineers. I have made many inventions myself, some of them relating to electrical subjects, including electrical welding generally as well as so-called spot welding, and have filed thereon, I think, more than one hundred applications for letters patent. I have been familiar generally with principles of electric welding for many years. More recently I have had occasion to look more intimately into the subject and have frequently had occasion to operate butt welding machines as well as spot welding machines with the purpose in view of finding out as much as I could about them and their operations. I have built a spot welding machine myself which I have frequently operated. During the time that I was intimately connected with Mr. Edison in the capacity of vice president of the Edison Storage Battery Company we had occasion to make use of oxy-acetylene welders for welding in place the tops of Edison storage batteries, so that I thus became familiar with this type of welding also.

Q. 3. Into what main divisions is electric welding divided?

A. Speaking generally, I should say arc welding, which in turn is sub-divided into processes using carbon and metal electrodes respectively, and second, resistance welding, or the so-called Thomson process. There seems to be some development also in so-called percussion welding.

Q. 4. How is arc welding practiced?

A. By causing an electric arc to be formed between a suitable electrode and the plates or metallic objects to be heated whereby the latter are brought to a very high temperature and frequently by



the use of a so-called melt bar to supply metal to the cracks or place to be welded. Also by causing the heat of the electric arc to be carried by conduction to the plate or metal object to cause a weld to be formed between surfaces to be joined.

Q. 5. What is resistance welding? I ask you to describe some applications of it in giving your answer?

A. Resistance welding or the so-called Thomson process is that in which the surfaces to be joined or welded are brought to the welding temperature by reason of their resistance to an electric current of large amperage which traverses the joint between the parts, the heat being localized as nearly as may be to the surfaces in contact or at least to the neighborhood of the contacting surfaces and after the metal at the contacting surfaces has thus been raised to the welding temperature pressure being applied to bring the heated parts into intimate molecular cohesion, thus forming a weld and practically consolidating the two parts into one. This resistance process of electric welding was first disclosed by Professor Elihu Thomson in his United States patents No. 347,140 and No. 347,141, of August 10, 1886. In the first of these patents the process is shown as being applied in a number of industrial fields, such as joining the ends of wires or bars (Fig. 3), securing rectangular bars together (Fig. 10), welding a shank to what appears to be a valve (Fig. 11), welding a round to a rectangular bar (Fig. 12), joining the ends of a ring (Fig. 14), and welding two smaller pieces to a larger piece (Fig. 15). In the second patent the process is shown for repairing the shank of a broken drill (Fig. 7) and also for welding the handle on a knife blade (Fig. 8). Obviously, when once the suggestion has been made of effecting a welding operation by utilizing the resistance of the work itself as well as the resistance between the parts to be welded, the carrying out of the process in various industrial fields became simply a question of engineering skill and required only the designing of a machine electrically to give the required heating current and the designing of proper clamps and electrodes to engage the parts to be joined properly together and to apply the proper pressure to the same to effect the welding operation. Some of the uses to which the underlying principles of the Thomson process or resistance welding may be applied are indicated in other and later patents granted to the Thomson Company, to which I will briefly refer.

First, I call attention to Thomson patent No. 396,015, dated Jan. 8, 1889, in which the same idea of utilizing the heating effect due to the resistance of the work is employed for the purpose, primarily, of heating a rivet blank sufficiently to permit it to be properly headed. Referring, for instance, to Fig. 1, it will be seen that the rivet blank R is placed in holes formed in the overlapping plates P, P', a heating current being led to the rivet blanks by electrodes E', G. The current passing through the rivet blank R will heat the same, because the rivet blank, being of smaller cross section than the electrodes, will therefore have a higher resistance and the heat will thus be largely localized in the rivet blank. After

the rivet blank has thus been heated to the required temperature to be sufficiently soft, the electrodes are caused to approach each other to the position shown in dotted lines in Fig. 2, thus forming or upsetting a head on each end of the blank and completing the riveting operation. Now, it will be noted that this Thomson patent describes two other things to which I would like to refer as indicating a further but perfectly logical development of the resistance process. In the first place, after stating that the current may be allowed to flow only to a sufficient extent to permit the swaging or heading of the rivet blank, the patent then says,—

“or the current may be allowed to pass for a longer period and until the central portion of the rivet, as well as the metal near thereto, is raised to a welding temperature, when the application of pressure expanding the rivet in its seat will weld the same to the metal surrounding it and the application of pressure to the pieces to be riveted will weld them together around the rivet.” (Page 1, lines 25-33).

I think the foregoing is perfectly clear; heat will obviously be carried by conduction to the metal surrounding the rivet and that metal, in the immediate neighborhood of the rivet will thus also be softened and also there will be a flow of current through the metal in the immediate neighborhood of the rivet because, as is well known, when metal is heated its resistance is increased and the metal surrounding the rivet would therefore offer a path of somewhat less resistance through which the current will pass and thus supplement the heating effect due to conduction from the heat of the rivet blank. Therefore, as Thomson points out in his patent, when a consolidating pressure is applied by the electrodes the rivet is not only headed, but is also welded to the surrounding metal and there will also be a welding of the plates themselves in the immediate neighborhood of the rivet. In other words, the rivet and the plates are practically consolidated, as shown in Fig. 6. In the second place, Professor Thomson, in this same patent says,—

“In some cases I may cause the electric current to flow across from pieces to piece of the parts to be riveted, as well as through the rivet itself.” (Page 1, lines 33-36).

The apparatus for carrying out this suggestion is shown particularly in Fig. 9, where, in addition to the heading or swaging electrodes for the rivet a heavy clamping piece is shown in the form of two electrodes engaging the plate in a diametric line with respect to the rivet blank, and these electrodes being in line with the corresponding electrodes engaging the other plate. If the mica blocks  $m$ ,  $m'$ , shown in Fig. 9, are interposed between these clamping electrodes and the plates, no current will flow, except through the rivet blank, and the function of the clamping electrodes will therefore be simply to press the plates tightly together. But Pro-

fessor Thomson recognized that the electrodes did not have to be insulated from the plates as shown in Fig. 9, but, on the contrary, he recognized that if they were not insulated a heating or welding current would traverse the plates between the opposed electrodes and thus weld the plates together at points corresponding to said electrodes. In other words, a situation will be presented where there are three paths for the current to take, one being through the rivet blank and the other two being through the plates themselves, and with this apparatus therefore three distinct operations will be performed, first, the rivet blank after being heated will be swaged or headed and second, two separate isolated welds will be formed, each of limited area on opposite sides of the rivet in a diametric line. This, I understand, is what the patent means by the statement I have already quoted, that the current may "flow across from piece to piece of the parts to be riveted", as well as from the following quotation from the patent:

"By the use of this form of apparatus a heating electric current might be passed through the metal plates themselves at parts around the rivet by means of the pressure pieces or clamps K, K'. Such current would assist in raising the portions of the plates immediately surrounding the rivet to the welding temperature." (Page 2, lines 68-75).

and I understand this is the effect that is referred to in the 6th claim which I quote:

"6. The herein described method of fastening two pieces of metal together, consisting in passing a heating electric current through a rivet or rivet blank, passing through the pieces as well as through the pieces of metal themselves in the neighborhood of the rivet, and applying pressure to set the rivet and *weld the pieces together.*"

I think it very clear that the comma in line 4 of the above claim should be introduced after the word "pieces", in line 5; in other words, the rivet or rivet blank passes through the pieces and the heating current passes both through the rivet blank and through the pieces themselves. The special significance of this particular Thomson patent, to my mind, is that, whereas, in his two fundamental patents of August 10, 1886, heating current was simply conveyed to the work and the engaging surfaces themselves determined the area or extent of the weld, in the patent of January 8, 1889, (No. 396,015), Professor Thomson recognized that conducting electrodes, if placed oppositely to each other, in contact with the two plates, would themselves concentrate the current in the work or, in other words, the current will follow the path of least resistance and hence will take the most direct path through the work from one electrode to the other. Thus, the heating current, passing in this way through the work from one electrode to the

other and being concentrated by the electrodes, will form a weld depending in size and shape upon the size and shape of the electrodes, and that weld will be isolated and will be surrounded by areas of non-welding. Not only will the electrodes thus concentrate or localize the current, but they also concentrate or localize the pressure, so that when pressure is applied the metal will be joined at the point or place or spot where the welding heat has been concentrated. The patent to Thomson which I have been considering thus shows further examples of the universality of resistance welding. When rivets are to be heated, the current is passed through them, converting the electric energy into heat, softening the metal, and permitting the swaging operation. If two plates are to be welded together in limited areas, the welding current is applied by means of electrodes which cause the current to be concentrated in a more or less distinct path, cutting the joining edges which are thus brought to the welding temperature, so that when the required pressure is applied a weld will be formed.

The next Thomson patent to which I will refer shows a further carrying-out of the same idea of resistance welding in which the resistance of the work itself is taken advantage of to secure the heating effect and thus bringing the engaging surfaces to the welding point. This patent, No. 444,928, dated Jan. 20, 1891, shows the welding together of two plates, the edges of which overlap by a continuous longitudinal weld such as might be desirable, for example, in the formation of seams in pipes or between plates. Such a weld is produced by overlapping the two plates  $M'$  and engaging the lap on opposite sides between roller electrodes  $R, R'$ , through which the current passes to the plates. The current is thus concentrated or localized by the electrodes; in other words, the current passes from one electrode directly to the other and the maximum heating effect is thus secured in the path to which it is thus confined, which path cuts the engaging surfaces of the two plates so as to largely localize the current at that point. A device such as the screw  $S$  is used to apply pressure to the electrodes. The operation is thus described:

"The edges are slightly overlapped, as shown, and the plates, being in position between the rolls, may be squeezed together by means of the screw  $S$ , thus forming an electric contact between them. The electric current being now turned on as it passes from one roller to the other and across the points of pressure will heat the work to the welding temperature and soften the same slightly, after which the screw may be given a few more turns to effect a solid union. The work, having been thus started, may now be moved along through or between the rollers, so as to bring successive parts of the joint into position to be pressed and heated at the same time. By this operation the metal will become thoroughly united as it passes through and out from between the rolls. It is obvious that the speed of the operation may be varied by varying the

rate of heating and the rapidity at which the work may be fed through the rolls." (Page 1, line 84; page 2, line 11).

When this patent refers to the preliminary welding of the plates "to effect a solid union" by first causing the roller electrodes to feed current to the work in a localized path and thus concentrate the current in a limited area at the weld by reason of the pressure applied to the electrodes by the screw, it does not add anything to the disclosure of Thomson patent No. 396,015, wherein the same thing is done, as I have explained, but where the patent further discloses the formation of a continuous weld by causing the work to progress with respect to the roller electrodes which continuously feed current to the work and cause progressive welding of the seam, it discloses a further carrying-out of the same general principles of resistance welding in which the resistance of the work itself is utilized to develop heat within the work to bring the surfaces to be joined to the welding temperature, the weld being formed when the requisite pressure is applied thereto. By using a pair of rollers as electrodes for conducting the current to the plates and concentrating the current and pressure therein to form a progressive weld, it is possible to utilize the process for the welding of strips of any length whatever, but in Fig. 2 Thomson discloses a modification in which the length of the weld is limited. Here, instead of employing roller electrodes, a pair of electrodes are shown each in the form of a segment of a circle and the length of the weld will therefore be limited to the length of the circumference of these segments. Otherwise the operation is the same as when roller electrodes are used, that is to say, the electrodes first engage the work to concentrate the current and form a preliminary weld between the engaging surfaces of the two plates. Pressure is then applied to squeeze the work tightly and consolidate the weld and then the work is moved downward so as to produce a progressive weld whose length is determined by the extent of the engaging surfaces of the two segments. The patent states that with this modification the strips or plates "are of comparatively limited length in the direction of the joint" (Page 2, lines 15, 16), but the operation of the apparatus and the carrying out of the described method would be the same, if very much longer plates were used, each operation producing a weld of a certain length and these welds being connected together or isolated, as might be desired. I observe that in this Thomson patent No. 444,928 the overlapped edges of the sheet lie within the working faces of the roller electrodes, so that while the electrodes concentrate and localize the heat and pressure longitudinally, it might be said that they do not localize the heat and pressure transversely. This seems to me to be an immaterial point, having nothing whatever to do with the principles of the invention but, in this connection, I call attention to the Lemp patent No. 553,923, of February 4, 1896, also owned by the Thomson Company, in which (Fig. 2) it very clearly appears that the roller electrodes are throughout their engaging surfaces located

entirely within the overlapped portion so as to concentrate the current and pressure by their engaging surfaces. It will not be necessary to consider this Lemp patent in detail, and I call attention to it solely because it very clearly discloses the use of electrodes which do in fact work within the area of the overlapped portions and which, therefore, do in fact indisputably localize the current and pressure.

The next patent to which I will refer shows a further field of usefulness with which the principles of resistance welding may be used, namely, the heating of two plates or pieces of metal electrically by reason of their internal resistance, such heating being utilized for the purpose of permitting a soldering of the two plates to be effected. This is the Thomson patent No. 496,019, dated April 23, 1893. Referring, for instance, to Fig. 1, if it be desired to secure the two plates P. P' together, they are engaged by electrodes C C', so that the heating current will heat the plates to the desired point to melt the solder, after which the current is cut off and the joint allowed to cool. Of course, with a soldering operation less current is used than with a welding operation, if we have reference, for example, to iron plates, and solder suitable for uniting iron plates. In other words, the heat required to melt such a solder would obviously be very much less than the heat necessary to bring the plates up to the welding temperature. But these things are purely relative; if you have to weld plates or pieces of iron, you use a higher temperature than when you weld plates of copper, and if you wish to weld plates of tin, although I have never tried it, I have no doubt that the heat would be very much less than for welding copper. With any weldable metal (and Professor Thomson in his original patent refers to "copper and its alloys, iron, silver, gold, etc.") the aim is to bring the metal up to the welding heat, so that a weld can be formed when pressure is applied, and I think it is the universal rule that this welding heat is always of a more or less extended range below the melting point. Therefore, in making the weld the object, as I have stated, is to so regulate the current and the time as to raise the metal to the welding point, when pressure is applied. Now, the reason why I have made this digression is because Professor Thomson, in this soldering patent No. 496,019 under consideration, says:

"When applied to tin plate the tin itself which covers the iron plate is often sufficient for the uniting solder." (Page 1, lines 12,-14).

And again he says:

"In the case of the pieces P P', of tin plate, a union takes place at the overlap when a sufficient strength of current to melt the tin between the surfaces has been passed." (Page 1, lines 96-100).



It seems to me that when we are dealing with tin plates an operation is performed that really is true welding, or, at least, so analogous to welding as to make it difficult to draw a distinction between the two. In other words, a tin plate can be regarded as a composite sheet, namely, a sheet of iron and a sheet of tin, and when these two composite sheets are placed together and the current applied, as suggested by Professor Thomson, there is a welding of the tin plates or layers, just as I believe there would be if the iron sheets were not present. While this patent, describes a soldering process from the standpoint of iron, in my opinion it describes a welding process from the standpoint of tin. It is a fact, referred to in the literature of the art, that Professor Thomson has in his possession a bar composed of nine distinct metals, welded together in line and manifestly in its formation there must have been a proper adjustment at each weld of the current to secure the desired welding temperature. In Thomson's patent No. 496,019 all sorts of modifications are shown and described by him illustrating the very extensive practical variations which can be made in applying resistance welding in various fields. For instance, in Fig. 2 the joint is shown as coextensive in length with the overlap of the plates, while in Fig. 3 a double-lapped joint is made tight and rigid by electrical soldering. And in Figs. 21 and 22 plates are shown which clearly are overlapped to a greater extent than the area of the electrodes, so that the current and pressure will be localized by the electrodes and the joint, whether it be a soldered joint or a welded joint, will be an isolated separate point, place or spot of attachment surrounded by metal of relatively large area in which there is no joint. This Thomson patent is of interest because it represents a further extension of the principles of resistance welding. Heretofore I have considered examples of resistance welding or riveting or soldering, as the case may be, in which the heat is developed from within the metals themselves due to their internal resistance. Of course, in any welding circuit heat will be developed elsewhere than in the work and in proportion to the resistance, and usually any heat thus developed outside of the work represents a loss of energy, and the usual practice is to reduce this loss as much as possible by having the secondary circuit of preponderous dimensions and water-cooling the conductors and electrodes. Nevertheless, when carrying on a resistance welding operation, even when water-cooled copper electrodes are used, the electrodes get very hot and a great deal of heat is developed where the electrodes engage the plates, so much so that the electrodes some times stick to the plates and they disintegrate and require to be quite frequently retrimmed by filing. In the patent under consideration, Professor Thomson points out that advantage may be taken of the heat developed in the electrode, and he shows in Fig. 7 the facing of the copper electrodes with blocks of hard carbon F, F', which he states is "for the purpose of producing an electrical resistance at the work, or where the current enters the work, which tends to the accumulation of heat thereat

with less current strength". (Page 2, lines 46-50). With this arrangement shown in Fig. 7, therefore, whatever heat is developed in the carbon layer on each electrode it is carried by conduction into the metal and thus reaches the joint between the parts. The current itself also traverses the plates and heats them by reason of the relative resistance of the plates. The respective heating effects thus secured by conduction from the heated carbon block and internally by reason of resistance will depend obviously upon the resistance of the blocks themselves and their contact resistance with the plates compared with the resistance of the plates. With thick carbon blocks most of the heating effect would be due to conduction. Professor Thomson, in this patent, points out other ways by which external heat can be produced than by the use of carbon blocks, namely, by providing the engaging faces of the electrodes with ridges, serrations points or projections whereby a condition of relatively high resistance is formed at the joint or place of contact between the electrodes and plates. This has a very similar effect to that secured when carbon blocks are used, except that with carbon blocks all the heat therefrom reaches the joint by conduction, whereas by concentrating by a large number of points or projections, as suggested by Professor Thomson, at each point there will be a concentration of the current and a consequent heating effect within the plates themselves.

This soldering patent so far as it discloses application of the heating current by means of an electrode which concentrates the current and pressure adds nothing to the Thomson patents already considered, but its suggestion of utilizing an external heating effect obtained by the same resistance principle is a further refinement in the art.

I have now referred to several Thomson patents which I had in mind to take up in answering your question, but before passing on to the work of other prior inventors in the art, I would like to refer to another patent of the Thomson Company's, for the purpose of illustrating the extent to which this same resistance principle had been applied by them. I refer to the patent to Lemp, No. 531,197, dated December 18, 1894. The patent relates to a process for softening in spots extremely hard steel plates, for instance, armor plates, so as to permit bolt holes, for example, to be drilled through the plates. It does not relate to welding, but it does disclose in my opinion a degree of engineering knowledge which I think would comprehend all the difficulties and problems that could arise in connection with welding. The patent says:

"My invention consists essentially in hardening the whole piece of steel or other metal, then locally heating *the spot* or portion in the body thereof to be softened, to the proper temperature by an electric current passed to the metal itself."  
(Page 1, lines 21-26).

And again :



"My invention consists further in certain appliances designed to aid in the purpose of locally heating by the electric current and of confining the heating to the desired spot." (Page 1, lines 42-45).

Referring to Fig. 4, it will be observed that B, B are two electrodes engaging the plates H at opposite sides and in line with each other, and in Fig. 3 these electrodes are clearly shown as much reduced in area at their engaging faces, the purpose for which is stated in the patent as follows:

"As will be seen in Figs. 3 and 4, the electrodes or contacts where they engage with the mass of metal are made rather small, this being for the purpose of *localizing the heating current* so far as possible and the undue heating at such points is prevented by the artificial cooling." (Page 3, lines 101-107).

The arrangement shown in Fig. 4 is thus described:

"If the plate or piece of metal be hard enough its whole thickness and not merely on its skin surface, the current may be made to enter at one side and leave at the other, passing entirely through the mass of metal." (Page 2, lines 46-51).

The electrodes shown in this patent are described as being of copper (Page 2, line 98), and they are shown as being hollow, so as to be water-cooled, the advantage of which is thus described:

"By thus keeping the contacts artificially cooled the heating of the mass of metal is better localized at the portions thereof between the electrodes themselves. In practice it will be found that when only a slight contact pressure is used there is a tendency of the metal at the surface in contact with said electrodes to heat more than at the portion between them, but by artificially cooling the electrodes the heating may be better confined as stated." (Page 3, lines 34-44).

Finally, the patent points out that by concentrating or localizing the current in the plate by means of substantially pointed electrodes, the metal in the spot to be heated can be brought "to a dull red heat" (Page 2, lines 29-30), and, of course, no one will question the fact that a higher heat will be secured if more energy is allowed to be converted into the heat within the path between the electrodes. Although, as I have said, this patent does not relate to welding, I refer to it simply for the purpose of showing how far the engineering knowledge of the Thomson Company had gone, at least as early as 1894. I point out the following features which are of special utility in the practice of welding: First, the fact that when two substantially pointed electrodes are engaged on the opposite faces of flat metal conductors, like two plates in contact, the current will be concentrated by the electrodes so as to follow a path immediately between them and thus localizing the heating effect. Of course, I do not mean to say that *all* the current flowing between the elec-

trodes is thus confined to a localized path as fully as it would be, for instance, as if following a rivet blank; there is a diffusion of the current outside of this path in proportion to the resistance, but, nevertheless, the current concentration applied in this way is sufficient to produce a heating effect. Of course, this fact has been previously recognized by Professor Thomson in the three patents to which I have referred, and I would not make a particular point of it, if it were not for the fact that Mr. Frank N. Waterman, who testified as expert for the complainant in the case of Thomson Spot Welder Company vs. Barney & Berry, Inc., was apparently impressed with the fact that this was a new idea with Harmatta. Thus Mr. Waterman said:

"It is based upon what is, electrically, a very interesting idea. If we place in superficial contact two extended surfaces all ordinary laws of electrical flow indicate that the current will distribute itself over the surfaces and flow alike through the entire areas in contact. Harmatta evidently conceived the idea that he could localize the current in particular limited areas of the contacting surfaces by the application of pressure."

After then referring to the well known Joule effect, Mr. Waterman continued:

"Now the current distributes itself in such a way, under ordinary circumstances, that the losses shall be least. Harmatta made a departure, from ordinary conceptions, in that he localized the current path in extended areas of contact by pressure, therefore concentrating the current in an area determined by the area of the applied electrodes, bringing that limited area to a welding temperature without material heating of the adjacent parts." (Transcript of Record, Barney & Berry Suit, Vol. 1, page 59.)

Of course, from an electrical standpoint, there is no distinction, as I view it, between a single plate, as described by Lemp and two extended surfaces in superficial contact, and if this is so, I find in the Lemp patent the precise character of current and heat distribution that Mr. Waterman believed was conceived by Harmatta.

Second, I find in the Lemp patent, not only substantially pointed electrodes concentrating current, but electrodes of copper so as to minimize waste due to heating effect in the electrode material.

Third, I find in the Lemp patent the suggestion of water-cooling the electrodes so as to keep their temperature as low as possible and prevent increase of resistance to the heating and also reducing the resistance between the electrode and the material to which the current is applied.

I will now refer to a few more examples illustrating the utilization of the same principles of resistance welding by others than the Thomson Company, not for the purpose, by any means, of exhausting the subject, but for the purpose of calling attention to prior

examples of resistance welding in which there is concentration or localizing of the current, whereby the welds appear as isolated points of attachment surrounded by extended areas of non-welding. I, therefore, next call attention to Robinson patent No. 574,942, dated January 12, 1897. In this patent the joint between two adjacent rails is formed by electrically welding a girder plate to the bottom of each rail, the adjacent girder plates being then bolted together, and by also electrically welding a splice bar between the adjoining rails to strengthen the joints and if used for electric railway purposes to reduce the resistance at the joints. Both in the electric welding of the girder plates to the rails and in the electric welding of the fish plate thereto, this patent is of special interest. The girder plate is shown at B, Fig. 2, and also in Fig. 1. It will be observed that there are three ribs or points *d* on the upper face of the girder plate, concerning which the patent says:

"The upper surface of the plate B is provided with a slight upward projection or contact point *d*. These points are brought in contact with the bottom of the rail in proper position preparatory to welding. When the welding current is turned on, it is localized at the point *d*, and *only these points and the corresponding points of the rail are brought to a welding heat*. As a consequence the weld is much more quickly made and with much less current than if the continuous upper surface of the plate B were brought in contact with the rail. This arrangement, therefore, is in the interest of economy and practicability. Perhaps a much more important consideration, however, is this: When the contact point *d* and the corresponding points of the bottom of the rail have reached a welding heat and the plate B and rail A are rigidly clamped together to produce the weld, the intervening part *e* of the upper surface of the plate B and the parts of the rail corresponding thereto have not been raised to a welding heat. Consequently, when these parts come together, the welding compression can force them no farther, and therefore the parts *e* and the normal bottom of the rail are retained in perfect alignment with the upper surface *f* of the other end *g* of the plate B. Thus provision is made for keeping the lower and upper surfaces of the adjacent rails in perfect alignment." (Page 2, lines 17-48).

Adjourned until Tuesday, July 23rd, 1918, at 9:30 A. M.

Tuesday, July 23rd, 1918.

Met pursuant to adjournment.

Present: Same as before.

Robinson employs the same idea of providing projections to concentrate the current and localize the welding in spots surrounded

by areas of non-welding, in connection with the welding of the splice bars or fish plates in position. The splice bar is shown, for instance, in Fig. 11, being provided with a number of points or projections which are also clearly shown in Fig. 12. The patent says:

"When the plate C is placed in the groove of the rail in position to be welded, these projections *i* find a bearing against the rail adjacent to the upper and lower corners of the groove of the same. The projections *i* are normally long enough to keep the main body of the plate C a short distance away from the rail. As soon, however, as the welding current is turned on it quickly brings the projections *i* and the parts of the rail touched by them to a welding heat. The clamp is now applied to press the plate C and rail together to complete the weld, as shown in Figs. 13 and 14." (Page 2, lines 92-105.)

The patentee points out that instead of employing projections as described on the splice bar or fish plate, he may use a series of ribs as shown in dotted lines Fig. 16, but he says:

"I prefer the arrangement of small independent projections to facilitate rapidity of welding, economy of current, and in order to have several small welding-spots distributed over the rail rather than to have any single large surface of the rail brought to a welding heat, since the latter would be liable to deteriorate the rail." (Page 3, lines 20-28.)

While, therefore, Robinson still makes use of the well known principles of resistance welding, he suggests the special refinement of welding the two pieces together in isolated spots (he calls them "welding spots") which will be surrounded by very much larger areas of non-welding, and he localizes the welding current in these spots by providing projections or points which are traversed by the heating current and brought to the welding temperature, likewise heating the plates with which they contact to the welding temperature, so that when pressure is applied each projection so heated will constitute or form a single spot weld.

The patent to Kleinschmidt, No. 616,436, dated December 20, 1898, discloses a very similar arrangement to that suggested by Robinson, except that the splice bar, instead of being formed with a considerable number of small projections, is provided with a somewhat larger single projection *b* near each end adapted to be electrically welded to the corresponding rail. The patent points out that—

"The bosses *b* extend only a very short distance from the main body of the bar, so that they will not prevent the bar from making close engagement with the rail and so that any ten-

dency which they may have to bog out will be prevented by the rapid cooling and compression to which they are subjected." (Page 1, lines 77-84.)

The Kleinschmidt patent illustrates very clearly the apparatus for applying the heating current to the splice bars, whereby the current will be localized by the projections or bosses in the same way as with the Robinson patent. That apparatus shown in the Kleinschmidt patent also applies the requisite pressure which will be concentrated by the projection or bosses, and the patent states that this pressure may be very great (25,000 pounds) and be allowed to compress and consolidate the parts for some time after the heating current is turned off. (Page 2, lines 2-7.)

I next call attention to the Burton patent, No. 647,694, of April 17, 1900. This inventor proposes to make an apparatus adapted for general metal working in which advantage is taken of the principles of resistance welding. He employs an ordinary blacksmith's anvil which carries a flat bed electrode 100 made of "highly conductive material, such as copper" (page 1, line 104). For the other electrode Burton employs a large number of forms depending upon the kind of work to be done. Therefore, a number of these electrodes are mounted radially like the spokes of a wheel and carried on a pivoted bar 150 normally elevated by a spring 170 but adapted to be depressed so as to apply pressure to the work by a foot lever 180. Instead of using an ordinary transformer, Burton proposes to employ "a dynamo-electric generator of peculiar construction which has a wide range of current as regards both amperage and voltage and which will supply a primary current of large volume and low voltage." (Page 1, lines 69-73.) The source of the current manifestly is unimportant and in no way alters the process. The form or shape of the electrodes, or at least some of them, is shown in Fig. 1, one of them (240) being spherical and another (250) being conical. Apparently the latter form is intended for countersinking screw holes as shown in Figs. 3 and 4. An interesting form of electrode is shown in Fig. 13 which is described as being "adapted for riveting," but which engages the plates as shown in the drawings when the rivet head has been upset. This engagement of the electrode is less than the overlapped portions of the two plates shown in that figure. The patent says:

"The invention is especially adapted for lap-welding by the use of a primary transverse current. The lap weld is superior to the butt-weld. No end pressure is required, and consequently there is no upsetting of the metal and no formation of a bulge or projection at the point, which is afterward required to be filed or hammered down." (Page 1, lines 14-21.)

And in describing the operation the patent says:

"In the use of this apparatus the pieces to be lap-welded are adjusted or placed with their ends overlapping on the bed

electrode 100. Then the foot lever is depressed, and one of the electrodes of the electrode head is brought into contact with the work, whereby the circuit is closed and the current passes through the work in transverse direction across the overlapping ends of the parts to be heated. The current may pass in either direction from the generator and effect the result equally well. As soon as the piece is heated to the proper temperature, which may be ascertained by inspection thereof, the operator releases the foot lever and the spring 170 lifts the hinge lever 150 and takes the upper electrode out of contact with the work, whereby the circuit is broken. Then the operator may shove the work forward on the anvil and hammer the joint or otherwise finish it, as desired." (Page 2, lines 67-87.)

I understand from the foregoing quotation that any one of the several electrodes may be used at the option of the workman, and if the plates are overlapped as described and an electrode such as the spherical electrode 240 or the conical electrode 250 is used the current passing transversely across the overlapping ends of the parts will be concentrated so that the internal heat will bring the contacting faces to or above the welding temperature, the heat being localized in a spot of limited area dependent upon the area of contact of the upper electrode. So far as I can see Burton does not say in so many words that the upper electrode applies pressure to the work, but it is inevitable that this should be so, because it is simply impossible to shove down a foot lever without applying very considerable pressure to the work. The weight of the foot alone would apply considerable pressure. It would be humanly impossible for the workman pressing down on the foot lever not to apply pressure to the work. Therefore, I entertain no doubt whatever that, if any metal worker should operate the Burton apparatus for making lap-welds as he describes and kept on the current until the welding temperature is reached, a spot-weld would be formed due to the inevitable and necessary pressure on the electrodes applied thereto by the pressure of his foot on the lever 180.

The patent to Perry, No. 670,808, of March 26, 1901, illustrates another interesting example of electric welding by the resistance process, wherein, for example, crossed wires supported by suitable electrodes (see Fig. 1) are brought together so as to form a weld at their meeting surfaces, due to the internal resistance of the wires and the resistance at the point of contact and to the pressure applied to effect the weld. Such a process would be excellently adapted for the making of a wire fence. Perry suggests the use of current of very great volume and he also suggests the employment of very great mechanical pressure to force the parts together, whereby the weld will be formed practically instantaneously. In this way, he says the parts in the neighborhood of the weld are kept perfectly cool so that even when the wires are coated with a metal of relatively low melting point, like zinc,

"the covering is practically uninjured about the joint and the joint is thus rust-proof." (Page 2, lines 27-29.)

And the patent goes on to say:

"Further, by my invention two parts (of which one is under tension) can be readily welded, for, although the abutting or contacting portions thereof reach a high temperature for an instant, the heat is localized about said surfaces and does not extend through the entire body of the said parts, thus preventing the body from being stretched, elongated, or bent at the weld or dominated by the described stress or strain, as would be the case if the welding operation were continued, as was done prior to my invention, over such a period of time that the entire body of the metal became heated and softened, so that it would be affected by such stress or strain, for by my invention merely the contacting surfaces are softened." (Page 2, lines 29-45.)

I call particular attention to this patent as showing a recognition in the prior art of effecting welds practically instantaneously or at least in a very short interval of time by using current of great volume whereby the heat will be localized principally at the joint and sufficient time is not allowed for substantial conduction of heat into the metal away from the joint.

I next refer to the patent to Rietzel, No. 928,701, dated July 20, 1909 (application for which was filed February 24, 1905), showing the same process of electrically welding metals together which had previously been described by Robinson, above referred to. In fact, the arrangement shown in Fig. 3 of the Rietzel patent is identical with that of the Robinson patent, the projections *c* of Rietzel corresponding to the projections *i* of Robinson. As with the Robinson patent these projections act to localize or concentrate the heating current as well as the pressure so that when the welding temperature is reached and pressure applied a series of isolated or spot welds will be formed surrounded by larger areas of non-welding. Rietzel describes a number of obvious ways of forming the projections which thus concentrate the current and pressure, for instance, by indenting one of the sheets (Fig. 1), or both of them (Fig. 2), or by casting corresponding projections on two plates (Fig. 4), or by interposing small metal disks between the two sheets or plates (Fig. 5), but in whatever way these projections are formed the process is the same, namely, the concentration of current and pressure at localized spots (or "small welding spots," as Robinson calls them) by which two plates or other objects will be intimately held together, said welding spots being surrounded by extended areas of non-welding, all as had been previously fully explained by Robinson, together with the advantages in actual practice arising therefrom.



Turning now, for a moment, to the foreign prior art, I direct attention to the German patent of Benardos, No. 50,909, dated May 8, 1889, issued February 19, 1890. The patent refers to the welding of "thin plates" and the first claim refers to "local heating." Fig. 2 illustrates a simple form of apparatus designed for local heating and thus welding together thin plates or other suitable metal objects. The apparatus is in the form of a pair of tongs composed of two levers  $K'$ ,  $K''$ , pivoted together at  $C$ , but electrically insulated one from the other, having wooden handles  $H'$ ,  $H''$ , by which pressure may be applied and adapted to be connected to the terminals of suitable heating current. At the outer ends of the lever  $K'$ ,  $K''$ , are electrodes  $w'$ ,  $w''$ , which engage opposite sides of the overlapped piece, where the "local heating" is to be done, so that current passing from one electrode to the other will be localized and concentrated in a path which cuts the joint. Benardos describes various materials from which to make the electrodes. Preferably, they are composed of "refractory material which is also a relatively bad conductor of electricity" and as examples of such materials he refers to graphite and prepared carbon. When carbon electrodes are used in the apparatus shown in Fig. 2 considerable resistance to the current will be met in the electrodes themselves as well as between the electrodes and the surfaces of the plates, and, therefore, heat from the electrodes and heat developed at the surfaces of the plates will pass by conduction to the joint between the plates to heat the same to the required temperature. There will also be resistance in the plates themselves and at the joint between the plates and heat will be additionally developed by the current itself in thus passing from one electrode to the other, which electrodes concentrate the current and the pressure. By thus heating the plates at the joint between them to the welding temperature in small spots or locally, dependent upon the size and shape of the electrodes and by applying pressure to the electrodes which thus localize the pressure, a spot weld will be formed uniting the plates together and surrounded by an extended area of non-welding. Obviously the process can be repeated causing the electrodes to engage at another spot where the sheets overlap and as many welds formed as may be necessary to secure the desired strength. It will be noted so far as I have described the Benardos process that it corresponds precisely with the suggestion of Professor Thomson in his patent No. 496,019, in which the electrodes are faced with carbon (Fig. 7), whereby external heat will be developed and will be carried by conduction to the joint between the surfaces to be secured together. Like Professor Thomson, Benardos also recognized that the process could be carried out in other ways than by principally developing the heat in the electrodes themselves, because he says that the electrodes may be made of magnesium or iridium, both of which metals are good conductors of electricity and which, if used, would result in very much more heat being developed in the plates themselves and at the joints between the plates than when carbon elec-



trodes are used. Furthermore, Benardos says that the electrodes may be made of "carbon with thin metal coatings," which, to my mind, indicates very clearly another example of an electrode which may be used where it is not desired to secure the principal heating effect by conduction from heated electrodes. Benardos had just as clear an appreciation of the problems to be solved as had Thomson. He describes very clearly an apparatus intended for welding thin plates together, and that apparatus will produce and can only produce a localized weld surrounded by an extended area of non-welding. Benardos points out that the weld can be formed by using carbon electrodes in which heat will develop by resistance to the current as well as heat at the point of contact between the electrodes and plates, whereby the heat will principally be caused to reach the spot to be welded by conduction. But he also just as clearly indicates that the electrodes need not be of this character and when a carbon electrode is used that is covered "with thin metal" or when a magnesium electrode is used, or when an iridium electrode is used a condition is presented in which, instead of the heat being principally developed in the electrodes themselves, the heat will be developed within the plates themselves and at the joints between the plates, the current and pressure being concentrated by the electrodes. In ordinary spot welding the usual practice is to weld iron or steel plates by the use of water-cooled copper electrodes. The resistance of the electrodes is usually less than the resistances of the plates, but even under ideal conditions, and even when the copper electrodes are water-cooled they become very hot. Furthermore, the resistance between the electrodes and plates is sometimes more than the resistance of the plates themselves and considerable heat is developed at the point of contact, so that as I have previously said, the electrodes sometimes stick to the plates and they always require retrimming. Sometimes considerable resistance is encountered between the plates themselves, and when this happens the maximum heat may be developed right at the point where the weld is to take place; but at other times the resistance between the plates may be so great that no current flows at all, and then the operator moves on to another point. These are all relative matters. I have made spot welds with iron electrodes and observed that the electrodes become red hot at their points and, of course, are very likely to stick to the work.

According to the text books copper is a considerably better conductor than magnesium, which, in turn, is a better conductor than iron, and all three of these metals are enormously better conductors than carbon. The conductivity of iridium lies about midway between iron and magnesium. If the welding operation is carried on with electrodes which are of higher resistance than the work itself, or if the contact between the electrodes and the work is a higher resistance contact, obviously more heat will have to be carried by conduction to the place of welding than when the conditions are reversed, or, in other words, when the electrodes are of less re-

sistance than the work and where the contact between the electrodes and the work is of low resistance. For the welding of iron or steel plates, therefore, copper electrodes are desirable, because of their low resistance and because they make good contacts with the plates.

If carbon electrodes are coated with copper they can be used successfully for the welding of iron or steel plates and I am very confident that iridium electrodes could also be used for the purpose, since iridium is a good conductor, it has an extremely high melting point, and it is practically non-oxidizable, so that it will make good contact. In fact iridium is used in the electrical arts for the making of contact points, owing to the difficulty with which it is oxidized. I am not so sure of magnesium, but I believe magnesium electrodes could be used for the welding of plates of metal of low melting points.

The form of apparatus shown by Benardos in his German patent, particularly in Fig. 2 thereof, if provided with carbon electrodes coated with thin metal, or with iridium electrodes of the form and relative size shown in this patent, and supplied with the proper current, could, in my opinion, be successfully used as described by Benardos for producing successful welds of limited area in the overlapped portions of iron sheets. These welds would not be distinguishable in any way from welds made with copper electrodes. The sheets would be intimately and strongly connected together by as many welds as might be formed, each of a small size, and surrounded by areas of non-welding. The backs of the plates would not be affected any more than when copper electrodes were used, i. e., there would be a local discolorization, due to heat, and possibly a slight denting of the metal where the electrodes engaged the same under pressure.

I next direct attention to British patent to Parkinson, No. 14,536 of 1894, showing a further carrying out of the process of resistance welding originally disclosed by Thomson in connection with what the patentee refers to as "glutting wheel spokes and bossing railway wagon and carriage wheel centres," although the patentee states generally that the invention—

"is designed to provide an apparatus for welding metal by means of electric currents passed through the articles to raise them to welding heat." (Complete specification, page 1, lines 21-23.)

The Parkinson apparatus appears to be a highly organized machine, but I will not describe the same in detail, but only so much thereof as relates to the welding of the so-called "glut pieces" in position by a process in which there is a concentration of current and pressure by means of an electrode. Referring to Fig. 3 it will be observed that the wheel is composed of a series of segments each formed of a bar bent in triangular shape, so that each spoke will be composed of a double thickness of metal. The thickness of these bars is shown in Fig. 3 and their relative width in Fig. 4, at C.

When these segments are arranged to constitute a wheel, as shown in Fig. 3, an angular recess will be formed in the circumference coincident with each of the double spokes, and the patentee proposes to fill each of these recesses with an angular shaped glut piece C", serving not only when rigidly secured in place to fill the recesses, but also to complete the circumference of the wheel and furthermore to stiffen and strengthen the wheel at the circumference. These glut pieces are made of metal and naturally would be of the same metal as the wheel itself, namely, iron or steel. The patentee proposes to weld these glut pieces in position by a process of electric welding in which advantage is taken of the resistance of the work as well as the resistance of the joint to secure the welding heat, the current in the work being concentrated so as to localize the heat by means of a more or less pointed electrode. These are the "contact arms" L shown in the patent and particularly in Fig. 3. Since it is necessary that there shall be two welds to hold the triangular glut pieces in position, there are two of these contact arms L co-operating with each glut piece, each contact arm or electrode tightly pressing against the metal of the wheel opposite to the glut piece so as to concentrate the heat and pressure therein. Engaging the outer face of each glut piece is a flat contact block M operated by a hydraulic ram so as to secure the desired pressure. Two dies are carried by the piston of the hydraulic cylinder and engage the sides of the glut piece, as shown in Fig. 4. In operation, when the contact piece M is forced by hydraulic pressure against the glut piece, the two contact arms or electrodes L will be pressed on the inside of the wheel opposite the glut piece, so that when heating current is applied it will flow from each electrode L through the metal of the wheel, past the joint between the same and glut piece and through the glut piece to the contact piece M. Each electrode L, therefore, feeds the current into the work in a limited area, and the current is, therefore, concentrated or localized by the electrodes, so as to heat the metal at the joints and within a localized area to the welding temperature, whereby, under the hydraulic pressure, a limited isolated weld will be formed between each wheel segment and one of the glut pieces, which welds will be surrounded by extended areas of non-welding. This patent, therefore, discloses a further field of usefulness to which resistance welding may be applied, namely, for the manufacture of railway or other wheels, it utilizes the same resistance principle originally disclosed by Professor Thomson, in which the resistance of the work is depended upon to secure the heating effect, the current is localized and pressure is localized by means of an electrode of limited area, whereby the heating current is confined to a restricted path which cuts the joint and in this way the heating effect is localized or restricted, whereby the metal at the joint within a limited area will be brought to the welding temperature so that when pressure is applied between the parts an isolated weld will be secured, surrounded by areas of non-welding.

I next refer to British patent to de Ferranti No. 11,921 of 1903, application for which was filed May 25, 1903, describing still another field of usefulness to which resistance welding may be applied, namely, the welding of turbine blades to the disks, drums or the like which carry them. Referring to Fig. 2, for instance, the disk or drum is shown as being provided with two sets of intersecting grooves *e* which result in the formation of a series of points or projections rectangular in cross section. The turbine blades *d* are now placed in position radially and when heating current is passed through the blades, the current will be concentrated by so much and so many of the projections as may make contact with the engaging surface of the blade, and by means of these projections the current will be concentrated so that the projections themselves as well as those parts of the blade surface as may contact with the projections will be brought to the welding temperature, whereby when pressure is applied a series of separate isolated welds will be formed surrounded by areas of non-welding. In Figs. 3 and 3a the same general principle is applied, except that the current is concentrated at the weld by forming the disk with two circumferential and parallel ribs, whereby two isolated welds will be formed to hold each blade in place. In Fig. 9a three of such ribs are shown, resulting in the formation of three isolated welds, and in Fig. 6 the face of the disk is bored with closely arranged holes *h* whereby the current will be localized by the metal between the holes, and the resulting welds will be surrounded by areas of non-welding.

Adjourned until Wednesday, July 24th, 1918, at 9:30 A. M.

Wednesday, July 24, 1918.

Met pursuant to adjournment.

Present: Same as before.

The references which I have made to the prior art, therefore, show the application of resistance welding for the joining of wires and rods of varying dimensions end to end and side to side, chain making, ring making, repairing drills, attaching handles to knives, making valves, welding plates and sheets of varying thicknesses, some very thin indeed, riveting and soldering of thin plates of sheet metal, general metal working such as might be carried out by a blacksmith, the making of railway and carriage wheels, the making of wire fence, the welding of girders to rails, welding splice bars and fish plates to rails and attaching turbine blades. Of course this does not by any means complete the uses to which resistance welding has been applied. In many lines of manufacture, such as the making of agricultural instruments, typewriters, bicycles and automobiles, resistance welding is extensively used.

(By Mr. Arvedson: The introduction of the following patents and testimony in regard to them is objected to since no one of these patents has been set up as defense in the answer:

*United States Patents.*

647,694, April 17, 1900, Burton

521,197, Dec. 18, 1894, Lemp

*German Patent.*

50909, issued Feb. 19, 1890, to Benardos

*British Patent.*

14536 of 1894 to Parkinson.

(The reference to the testimony of Mr. Waterman in some other litigation and the comments generally upon other litigation matters connected therewith are objected to as utterly immaterial, irrelevant and incompetent.)

(By Mr. Church: Counsel for defendant here gives notice that formal application will be made, in due course, for the amendment of defendant's answer to include the patents objected to as not already set up in the original answer.)

Q. 6. In your answer to Q. 4 you refer to the practice of arc welding. Can you refer to an early patent exemplifying an application of this sort of electric welding?

A. Yes, I refer to United States patent to Benardos and Olszewski, No. 363,320, dated May 17, 1887.

Q. 7. Have you examined and do you understand the Harmatta patent in suit, No. 1,046,066, dated December 3, 1912, the application for which was filed December 3, 1903?

A. I have and do.

Q. 8. Have you examined and are you familiar with the file wrapper and contents of the said Harmatta patent and particularly the original specification, claims and drawings of Harmatta, shown therein?

A. Yes, sir.

Q. 9. I hand you what purports to be a printed copy and what I believe to be a line copy of the original application of Harmatta as filed December 3, 1903, and ask you to state whether or not it is a faithful copy of the original found in the file wrapper of the Harmatta patent in question?

A. It is.

Q. 10. Will you please state to what you find the original application of Harmatta relates?

A. The original application states that the invention

"relates to a process of and apparatus for manufacturing metal articles of all kinds, in particular those of the thinnest sheet metal, by direct electric welding."

Q. 11. Will you please describe the apparatus shown in this original disclosure and the described mode of using the same?

A. The original Harmatta application describes two forms of apparatus, one by which—

“continuous welding may be undertaken, that is to say an uninterrupted welded seam made,”

and the other by which—

“to weld, for instance, sheets of metal only at particular places.”

The first form of apparatus is shown in original Figs. 2 and 3, and its application to the welding of a hollow or tubular article is shown in original Fig. 4. This apparatus comprises two arms or conductors *c*, *d*, in the lower of which arms is mounted a roller electrode *h*. The upper roller electrode *g* is mounted in a forked member *e* capable of vertical movement with respect to the upper conductor *c* whereby the upper roller electrode *g* may be moved down to press the work between the two electrodes, or moved upwards away from the work. This vertical movement of the upper electrode *g* is effected by a pinion *p* actuated by a lever *r* and engaging a toothed rack *u* cut in the shank of the forked member *e*. In order to rotate the upper roller electrode *g* Harmatta employed a hand wheel *l* driving the shaft of said electrode through gears *m*, *k*, Harmatta also shows a bevel gear on the shaft of the roller electrode—

“should it be desired to automatically advance the object being welded by means of motor power.”

The operation of this apparatus was thus described:

“If now the ends of the object to be welded are introduced between the two roller electrodes *g*, *h*, and the circuit closed, continuous welding may be undertaken, that is to say an uninterrupted welded seam made, whereby the upper rotary roller electrode *g* may be pressed with any required degree of pressure upon the lower stationary (or rotary) roller electrode *h* so that the two ends of the material to be welded are firmly connected with each other.”

Having thus described an apparatus designed and intended for the making of uninterrupted welded seams, Harmatta then points out that the same process can be used when—

“it is required to weld, for instance, sheets of metal only at particular places.”

For this purpose the modified apparatus shown in Fig. 5 “may be advantageously employed.” With this apparatus there are two

It will not be necessary for me to review the prior art, but I have already referred to many instances in which "direct electric welding pressure" has clearly and indisputably "been exercised by means of electrodes located in the direction of the current directly above the surface or point being welded." And of course the history of the Harmatta application shows that he was mistaken.

Q. 13. As one skilled in the art of electric welding what inference, if any, would you draw as to the relative breadth of conception of Harmatta and Benardos (as disclosed in the Benardos German patent) from the fact that Harmatta says nothing about the material of his electrodes, while Bernardos describes his electrodes as being constructed of different materials, varying largely in conductivity?

A. I should say that the conception of Benardos was distinctly more comprehensive than that of Harmatta. All that Harmatta clearly proposes is that pressure "at the place at which welding is to be done" may be applied by one or both of the electrodes, whether the electrodes be rollers or pins. As to practically everything else, except matters of mechanical construction, Harmatta was wholly silent. Benardos, however, not only fully and clearly comprehended within his conception the welding together of thin sheets, either by continuous welds or by local welds, but he also within that conception comprehended the application of pressure at the point where welding is done, in some cases by one electrode and in other cases by both electrodes, and furthermore, that conception comprehended electrodes within which most of the heat would be developed, so as to be carried by conduction to the welding point as well as electrodes of good conductivity whereby most of the heat will be developed within the plates themselves and at the joint between the plates, and finally that conception of Benardos comprehended the application of heat to the plates from heated electrodes, the path of the current being confined to the electrodes and not including the plates. In fact, I should say that the Benardos German patent was a very clear and complete exposition of the art of welding thin plates together electrically.

Q. 14. If the apparatus shown in Figs. 1 and 5 of the drawing of the original application of Harmatta were employed for welding thin metal plates together by the use of a competent electric current and the electrodes provided were of carbon coated with metal, could effective resistance welding otherwise known as local or spot welding be accomplished?

A. Yes.

Q. 15. And suppose, instead of employing electrodes of carbon coated with metal, iridium electrodes were employed, what would be the result?

A. The same spot weld.



Q. 16. And suppose tungsten electrodes were employed, what would be the result?

A. The same spot weld.

Q. 17. And suppose carbon electrodes were employed, uncoated with metal, what would be the result?

A. The same spot weld, although there would be the likelihood of slightly roughening the plates where the carbon electrodes made contact.

Q. 18. On the other hand, suppose that in the apparatus shown in Fig. 2 of the Benardos German patent electrodes of carbon coated with metal were employed for applying current and pressure to superposed thin metal plates, what would result?

A. The apparatus of Fig. 2 of the Benardos German patent to all intents and purposes is identical with the apparatus of Fig. 5 of the original Harmatta disclosure and under the assumption of your question the result would be the same, namely, a spot weld between the plates.

Q. 19. Would the result be any different if the electrodes in the case supposed were of tungsten or iridium or copper or other material more highly conductive than that of the metal plates to be united?

A. The results would be the same.

Q. 20. How does the form of the contacting surfaces of the electrodes shown, for instance, in Figs. 1, 5 and 6 of the original application of Harmatta compare with the form of electrodes shown in Fig. 2, for instance, of the Benardos German patent?

A. In the Benardos German patent the contacting area is a small square. With the electrodes of Figs. 1 and 5 of the original Harmatta disclosure the area of contact appears to be a very small dot or circle. With the form of electrodes shown at the left of Fig. 6 of the original Harmatta disclosure, the area of contact is in the form of two parallel lines. With the form of electrode shown at the right of Fig. 6 of the original Harmatta disclosure, assuming that these electrodes are rounded, as they appear to be, the area of contact would be a point.

Q. 21. Professor Thomson, when examined as a witness in this case, was put this question:

"Q. 90. Tungsten being of relatively higher conductivity would answer well and might be used were it not so expensive. Am I right about this?"

and he answered:

"A. Yes, I have known of its being used in special ways and in special cases and with considerable success."



Do you or do you not agree with Professor Thomson as to the availability of tungsten for electrodes in so-called spot welding machines?

A. I agree with him.

Q. 22. Professor Thomson was also asked these questions:

"Q. 91. How about iridium? Might not that be used but for its high cost?

A. It is not as good a conductor as you could wish and the cost is about \$175 an ounce.

Q. 92. But you think it might answer for an electrode for a spot welding machine if the cost were not too high?

A. It might if it did not have so high a resistance which would waste energy. I don't think anybody is likely to try it."

I ask you if iridium might not be used effectively as an electrode or electrodes in a spot welding machine and also to tell us what the relative resistances or conductivity of iridium and tungsten are?

A. Iridium electrodes could be effectively used for this purpose. The text books place the conductivity of iridium and tungsten between iron and copper, tungsten being of somewhat better conductivity than iridium.

Q. 23. Is the resistance of iridium less or greater than that of iron?

A. Less.

Q. 24. Is the conductivity of iridium greater or less than that of iron?

A. Greater.

Q. 25. Given two superposed thin iron or steel plates to be united or welded together by the heat generated by the resistance to the electric current passed through the plates by electrodes which also apply pressure at the point where the current passes, what determines whether the heat is developed in the electrodes themselves, at the points of contact between the electrodes and the plates, in the plates themselves, or at the contact surfaces between the plates?

A. The resistance to the current at the points mentioned. If the resistance is doubled, for example, and the current remains the same, the heat will be doubled. If the current is doubled, and the resistance remains the same there will be four times the heat. Of course, these are all variable factors. Sometimes the resistance between the electrodes and plates may be greater than the resistance of the plates including the joint between the plates, and at other times the resistance of the plates may be greater than the resistance between the electrodes and plates. The thing to do in welding is to get

enough heat between the surfaces to be welded to bring those surfaces to the welding temperature.

Q. 26. And in how many ways may this be done?

A. I should say the ideal condition would be such as to generate as much heat as possible at the joint between the plates so as to localize the heat as much as possible at the places to be welded and to develop as little heat as possible elsewhere in the circuit. This would mean using electrodes of high conductivity and of as large cross section as possible (except at the point of contact) and properly water-cooled, and having the point of contact with the plates just as perfect as possible, for instance, by solder, and employing sufficient current to form the welds very quickly, so as to reduce loss by radiation and conduction. But, of course, this ideal condition is not realized and much heat is likely to be developed at the outer surface of the plates so that, as I have said, the electrodes sometimes stick to the plates and they tend to disintegrate and roughen at the point of contact, so that every once in a while they must be retrimmed by filing.

Q. 27. In the Thomson patents 347,140 and 347,141, at what point is the resistance to the passage of the welding current relied upon to produce the heat necessary for welding?

A. In the metals themselves through their resistance and at the joint where the metals abut. In the actual operation of butt welding machines when two pieces are welded together end to end, the weld appears to be a progressive one proceeding very rapidly after sparking stops.

Q. 28. In the Thomson patent No. 396,015, which has been referred to as the riveting patent, at what point is the resistance to the passage of the electric current relied upon to produce the heat to effect the welding of the plates shown before union in Fig. 10 of the patent, and after union, in Fig. 7 of the patent?

A. In the plates themselves and at the joint between the plates in line and coincident with the concentrated current passing from one electrode to the other electrode.

Q. 29. In the Thomson patent No. 444,928, at what point is the resistance to the passage of the current relied upon to produce the welding heat?

A. In the plates themselves and at the joint between the plates in the path of the current concentrated by the two electrodes.

Q. 30. I ask you the same question with respect to the Lemp patent 553,923, having special reference to Figs. 1 and 2?

A. With this patent, in which as I have previously stated, the current is concentrated by the electrodes and the heating effect relied upon to secure the weld is due to the resistance of the plates as well as the joint between the plates.

Q. 31. In the Thomson patent No. 496,019, at what point does the resistance to the passage of the current produce the

welding heat, having reference particularly to the apparatus shown in Fig. 6 of that patent?

A. The heat results from the resistance to the passage of the current offered by the two sheet metal pieces as well as the joint between them.

Q. 32. How as to the modification of the apparatus of this patent No. 496,019 shown in Fig. 7, where the electrodes are faced with carbon?

A. Here most of the heat would be developed in the electrodes themselves and at the point of contact between the electrodes and plates and would be carried by conduction to the joint between the plates.

Q. 33. In the Robinson patent 574,942, where is the resistance to the passage of the electric current relied upon to produce the welding heat?

A. In the case of a girder bar shown in Figs. 1, 2 and 3, the current is concentrated or confined by the projections or contact points *d*, which, therefore, because of their high resistance, become highly heated, and heat is also developed at the points of contact between said projections and the rail. With the splice bar, shown in Fig. 11 for example, the current is concentrated by the projections *i*, and also at the points of contact between said projections and the rail, and by reason of this concentration said projections and the surfaces with which they contact are brought to the welding temperature.

Q. 34. Same question as to the patent of Kleinschmidt. Where in the device of that patent is the resistance to the passage of the current relied upon to raise the parts to be joined to welding temperature?

A. In the bosses *b* and points of contact between said bosses and the rail, whereby the current is concentrated and the heating effect is obtained.

Q. 35. In the Perry patent No. 670,808, where is the resistance to the passage of the electric current relied upon to produce the welding heat?

A. At the point of contact between the crossed wires where the current is concentrated and raises the metal to the welding temperature.

Q. 36. Where in the case of the balls or spheres shown in Figs. 6 and 7 of this Perry patent?

A. At the point where they contact and the current is thus concentrated.

Q. 37. In the case of the de Ferranti British patent, at what point does the resistance to the passage of the welding current raise the parts to the welding heat?

A. In Fig. 2, wherever one of the small projections makes contact with the turbine blade current will be concentrated thereby and heat will be produced in the projection and at the

point of contact between it and the blade, thus securing the welding heat.

Q. 38. In the Burton patent 647,694, where is the resistance to the passage of the electric current relied upon to produce the welding heat?

A. In the plates themselves and in the joint between the plates.

Q. 39. The Burton patent specifically mentions wheel tires as articles to be welded, does it not?

A. Yes.

Q. 40. Wheel tires are made of relatively thin metal, are they not.

A. Yes.

(By Mr. Arvedson: Question objected to.)

Q. 41. What has been your observation as to the thickness of metal wheel tires?

A. That depends of course upon the size of the wheel and the desired load it shall carry, but I have seen tires the thickness of the metal of which is certainly not greater than one sixteenth of an inch, and of course with very heavy wheels I have seen metal as thick as three-eighths of an inch or more.

Q. 42. The Burton patent speaks of the advantages of a lap welded joint. It shows in Fig. 13 means for applying rivets by an electrical welding process to such lap welded joints, does it not?

A. It does.

Q. 43. Now, in that form of apparatus shown in Fig. 13, what do you understand to be the electrodes?

A. The bed electrode 100 which has a recess therein to receive the rivet head and the movable electrode 210.

Q. 44. How do you understand this rivet is applied? Give us your understanding as to how the securing of this overlapped joint of Fig. 13 is effected.

A. I would understand that with the arrangement of Fig. 13 the rivet was provided with a head similar to that shown in contact with the top plate over which the upper electrode fitted, so that when the rivet was pressed upon by the electrode and the circuit was closed so that as current would flow through the rivet, the latter would be brought to the welding temperature and the head on the lower end swaged by reason of the cavity in the bed electrode. If, however, the head of the rivet was formed on the bottom, then the recess in the upper electrode working on the hot metal would form a head on the rivet, as shown. If a rivet blank were used, then both heads would be formed during the process of riveting. All of these operations being fully explained in the Thomson riveting patent. Whichever way the head of the rivet may be formed in the

Burton apparatus, the current will first be concentrated in the rivet blank to heat the rivet and after the rivet has been headed to that the plates themselves will be squeezed between the two electrodes, current will be permitted to flow between the electrodes so as to be concentrated by the same and by reason of the resistance of the work and of the joint between the plates a weld will be formed. Of course, Burton, as I have said, contemplated making these welds without necessarily performing a riveting operation, as he explains in paragraph commencing line 67, page 2.

Q. 45. What means are provided in the Burton patent for upsetting the rivet where a rivet is used and for clamping the overlapped parts of metal between the electrodes?

A. The rivet is upset or headed by one or both of the electrodes, both of which are suitably recessed for this purpose. The work is clamped or held by pressing downward on the upper electrode through the foot lever 180, and this not only applies pressure between the parts but also closes the electrical circuit, so that the current flows.

Q. 46. Turning, now, to the form of electrode shown at 240 in Fig. 1 of this Burton patent, how does the contact surface of this electrode compare with the contact surface of the electrodes shown in Harmatta's original disclosure?

A. It is practically identical with the form of electrode shown at the right, Fig. 6.

Q. 47. Suppose, now, we are dealing with the apparatus of the Burton patent and are desirous of electrically welding the overlapped ends of a metallic tire by means of the proper bed plate 100 and the form of movable electrode having the spherical end 240. Please state how you would proceed under the disclosure of the patent to effect this welding operation and the characteristics of the weld that would result?

A. In the first place, as stated by Burton, I would place the pieces "to be lap welded" on the bed electrode 100 "with their ends overlapping" (page 2, lines 68-69); then I would select the electrode 240 which is "one of the electrodes of the electrode head" (page 2, lines 70-71); then I would depress the foot lever (page 2, line 70) so as to bring that electrode "into contact with the work" (page 2, line 72). In this way, "the circuit is closed and the current passes through the work in transverse direction across the overlapping ends of the parts to be heated" (page 2, lines 73-76). "As soon as the piece is heated to the proper temperature" (page 2, lines 78-79), which I would know by inspection, I would then release the foot lever (line 81) and the spring 170 would then elevate "the upper electrode out of contact with the work, whereby the circuit is broken" (lines 83-85). In this way I would have made a spot weld between the overlapped parts and if desired I could hammer the joint or otherwise finish it. I know a

spot weld would be formed in this way, because the electrodes would concentrate the current in a restricted path, and by reason of the resistance of the work and the resistance of the joint the metal would be heated at the joint to the welding temperature in a limited area. Pressure would be applied to the electrode because when the electrode is pressed down with the foot it is impossible to avoid applying pressure. The weld so formed would be an isolated weld of small area due to the concentration of the current and it would be surrounded by an extended area of non-welding. Furthermore, as pointed out by Burton, there would be "no upsetting of the metal and no formation of a bulge or projection at the joint" (page 1, lines 18-20). In other words, the weld would be concealed within the joint between the overlapped pieces.

Q. 48. In ordinary spot welding machines such as used by the defendant the pressure applied to the movable electrode is transmitted through a yielding spring is it not?

A. It is.

Q. 49. How much pressure is required to spot weld, according to your experience with such a machine?

A. I am unable to give any figures, but not much pressure is required for ordinary sheet metal because I have frequently placed my hand between the electrodes and brought them down without any painful pinching.

Q. 50. Brought them down how?

A. Forced the foot lever down as far as it would go so that my hand was squeezed between the two electrodes.

Q. 51. To what extent?

A. I operated the machine in the usual way, bringing the foot lever down as far as it would go and depressing the spring more than would be done in actual practice, because the thickness of my hand is many times more than the thickness of the plates. I made most of my experiments with plates about .020 inch in thickness.

Q. 52. Something has been said by the witness Gravel and by Professor Thomson as to the actual advantages that flow from the employment of tapered electrodes in electric resistance or spot welding machines. Can you point to instances in the prior art, that is to say, in the art that existed prior to 1903, of the use of such tapered electrodes?

A. By tapering electrodes the current is concentrated and caused to follow a path of smaller cross section than when the electrodes are not tapered. This tapering of the electrodes for this purpose is shown very clearly in the Lemp patent No. 531,197, to which I have referred (See Fig. 3). It is also shown in Thomson patent No. 396,015 (See for instance electrode K, Fig. 9). A roller electrode is the same as a tapered electrode because it concentrates the current in the same way (See Thomson patent No. 444,928). Tapered electrodes are also shown in

Thomson patent No. 496,019 (See C, C', Fig. 1). The Lemp patent No. 553,923 shows roller electrodes, and in Fig. 2, these electrodes are tapered, and, of course, the curvature of their circumference is also equivalent to a taper. The Robinson patent No. 574,942 does not show electrodes for concentrating the current, but the projections *i'* Fig. 12, are clearly shown as tapering for the purpose of concentrating the current and heating effect, where these projections make contact with the rail. The Burton patent No. 647,694 shows two tapered electrodes in Fig. 1, namely the electrodes 240 and 250. The two crossed wires in the Perry patent No. 670,808 are tapered or reduced in area at the meeting faces to concentrate the current, and the same is true when two spheres are welded together as shown in Fig. 6. The Rietzel patent No. 928,701, in Figs. 1 and 2 shows that the projections are tapered for the purpose of concentrating the current and heat at the points of contact. The Benardos German patent, No. 50909, clearly shows tapered electrodes (See Fig. 2). And, finally, the Parkinson patent illustrates the contact pieces L as being tapered to thus concentrate the current and localize the welding.

Q. 53. I gather from the testimony of Mr. Gravell, plaintiff's expert, that his idea is that in making a spot weld, so-called, the area of the welded portion is limited and circumscribed to the area of the contacting portions of the opposed electrodes through which current and pressure are applied. Do you or not agree with Mr. Gravell as to this?

A. I think that Mr. Gravell correctly describes spot welding as it is often carried out where the plates themselves are in contact throughout an extended area and where the current itself would be truly concentrated by the electrodes, and the resulting weld would therefore depend upon the area of contact between the electrodes and plates. But, in other cases, I think that the electrodes themselves tend to pinch the plates or buckle them outwards so as to form points which meet, at which points the welding heat would be developed.

Q. 54. Do you or not think that the area of weld is precisely coincident with the area of pressure of the electrodes, or only substantially so?

A. I think it is only substantially so.

Q. 55. Give your reason for so thinking?

A. In the first place, I have made many welds with the same electrodes, pulled those welds apart, and did not observe that they were always precisely the same size, and then I think the time element is important, and if sufficient time is given the weld is generally larger and a better weld than when too little time is given. My observation is that while I believe the area of welding is substantially determined by the area of contact of the electrodes it is not mathematically certain that the weld



will be precisely equal, either to the area of contact or the pressure.

Q. 56. State whether or not work characterized by the absence of extrusion of metal referred to by Mr. Gravell in his testimony, is the same as or different from the quality of the work produced by Burton and referred to in the Burton patent, (Page 1, lines 17 et seq.)?

A. Of course, with a spot weld or any other kind of a weld formed between two flat surfaces and circumscribed by areas of non-welding extrusion of metal is not apparent or observable, but this does not mean that there is none. Moreover, in spot welding there is frequently metal extruded at the back of the plate, but to the extent that extrusion is concealed by the very fact that the weld is concealed Mr. Burton made identically the same observation that Mr. Gravel refers to when he says that

"consequently there is no upsetting of the metal and no formation of a bulge or projection at the joint." (Page 1, lines 17-20).

Q. 57. You have read, have you not, the depositions given by Mr. Gravell and by Professor Thomson, in this case?

A. I have.

Q. 58. And you have examined, have you not, the muffler tube offered in evidence as of defendant's manufacture, marked "Plaintiff's Exhibit No. 2"?

A. Yes.

Q. 59. And do you recall that that exhibit shows a number of weldings at different points of the overlapped portions, some of which are remote from the edges of the overlapped portions and some of which are at the very edges thereof, the former being entirely surrounded by unwelded portions of the metal and the latter only partially surrounded by such unwelded portions? Is there any distinction in principle between the making of these several welds by the same machine.

A. None, in the world, that I can see. I have frequently watched workmen at the Ford Plant making these muffler shells and they followed precisely the same procedure, no matter where the weld was located with respect to the joint. In every case the current and pressure were concentrated by the electrodes and a weld was thus formed.

Q. 60. And do you draw any distinction, or may any distinction be properly drawn between a weld made by such an apparatus, whether it be wholly or partially surrounded by unwelded portions of the metal?

A. Possibly a weld formed entirely within the joint would look a little neater, but so far as the weld is concerned, I do not see the slightest difference between the two.



Q. 61. Mr. Gravel, as I understand him, attempts to make a distinction between what he calls a spot weld and what he calls a line weld. I would ask you if there is any real distinction between the two?

A. I do not see the slightest distinction between the two. They are both made with the same process, current and pressure being concentrated by the electrodes in each case. When a spot weld is formed the current traverses a single path and heats the metal between the plates in that path to the welding temperature, and the weld is thus made. In making a so-called line weld, we first make a spot weld, that is to say, the electrodes are brought in contact with the work to concentrate the current and pressure and bring the surfaces of the metal of the two plates to welding temperature and we then apply pressure to the electrodes to cause the metal to coalesce. Then having made that spot weld we move the plates with respect to the roller electrodes, the movement being such that a continuous weld is formed, but at each point in the travel of the plates the same identical process is being performed, or, in other words, the current is being concentrated by the electrodes, the surfaces rise to the welding temperature, and the pressure consolidates the weld. Even when making so-called spot welds the workman sometimes gives to the pieces under treatment a slight oscillating motion, causing the work to roll slightly with respect to the electrodes, and making the weld somewhat longer than it otherwise would be. The Thomson patent No. 444,928 shows in Fig. 2 an arrangement in which the length of the weld is limited by the circumference of the segments. If the electrode of an ordinary spot welding machine were made loose, so as to oscillate like a toggle, they would make the same kind of a weld.

Q. 62. What do you find, if anything, in the disclosure of Harmatta's original application as to any distinction between the welds made by roller electrodes?

A. I don't find that he made any distinction at all. After describing the process of making continuous or uninterrupted welds he says that:

"If it is required to weld, for instance, sheets of metal only at particular places, the apparatus shown in Fig. 5 may be advantageously employed."

To my mind this means that we do not change the process, but simply change the apparatus. I also call attention to the fact that Harmatta in his original disclosure, referring to Fig. 3, uses the expression "advancing series of single points of the seam to be welded", thus showing that in fact a seam weld is practically a multiplicity of single welds.

Q. 63. If the roller electrodes of Thomson or of Lemp or of Harmatta's original disclosure are squeezed down upon overlapped sheets of metal and current passed through and the pressure is

removed **after** the weld has been made, would or would not such weld be surrounded by an area of no weld?

A. The weld would be surrounded entirely by an area of non-welding.

Q. 64. Suppose, now, the rollers or the work were manipulated so as to make a line of welding, say a quarter of an inch or an inch long, would such an elongated weld be a spot weld and surrounded by an area of no weld?

A. It would be.

Q. 65. Could you tell from an examination of a weld an eighth of an inch wide and a quarter of an inch long whether it was made by electrodes an eighth of an inch wide and a quarter of an inch long, or produced by roller electrodes an eighth of an inch wide that had been moved so as to produce a weld a quarter of an inch long? In other words, would the resulting product in the two cases supposed be substantially the same or substantially different?

A. They would be the same. Of course, in one case, more current would be required, and in the other case more time.

Q. 66. Is, or is it not, practicable to unite overlapped sheets of metal by roller electrodes in accordance with what you have termed the electric resistance process?

A. Yes, I consider the process as highly feasible.

Q. 67. And by such process can you produce a continuous weld or a continuous seam.

A. Yes.

Q. 68. Professor Thomson, in his testimony, has indicated that in the spot welding of very thin sheets of metal the effect of the electrodes is to pinch the flexible sheets so as to cause them to crown as it were at the point of pressure, and thus project the parts of the sheets at the point of pressure beyond the surface of the unpressed portion of the sheets. Do you agree with him that this may be the result of the action of the electrodes on thin flexible sheets of metal?

A. Yes, I think that is a reasonable assumption, and in fact I have observed the same thing myself.

Q. 69. Have you any illustration or photograph of work tending to exemplify this idea?

A. Yes, I here produce six photographs illustrating the manufacture of mufflers at the Ford Plant and showing particularly the spot welder employed for welding the overlapped seam of the interior shell. These Ford mufflers are made of three shells nested together or one within the other, and the first photograph I produce shows the shells before they have been assembled. This photograph is marked "A-1". It will be noted that the outer and intermediate shells are provided with interlocking lapped joints, and the only effect of the welding is to consolidate the metal at the welding spots to make the joint a little stronger and to prevent rattling. As is well known explosions frequently take place in mufflers and spot welding is too uncertain to be relied upon for the entire strength of the joints of these larger shells. In fact,

it is the rule of the Ford Company never to spot weld the parts on which a man's life may depend or where absolute certainty is necessary. The next photograph, marked "A-2", shows the same parts after welding. It will be noted that every one of the four welds on the inner shell overlap the joint so as to squeeze out the metal or cause it to extrude. This is the common thing in making these shells, as the workman operates very rapidly and the easiest line for his eye to follow is the side of the overlapped edge. The welds formed on the intermediate shell also show extrusion, and this also is the customary practice. By exercising care the workman could always locate the welds in the overlapped seams, but he is in too much of a hurry to do this and forms the welds in the seam wherever the electrode may strike. So far as the strength of the joint is concerned, it makes no real difference whether the weld is slightly off center or not. The work shown on the outer shell is more carefully done because some degree of neatness is desirable with this part which is exposed, but one of these welds plainly shows the extrusion of metal. In the next photograph marked "A-3" is shown the spot welder used for welding the interior muffler shell at the Ford Plant, a pair of clamping jaws being provided surrounding the lower electrode arm for bringing together into overlapping position the metal to be welded. The lever which extends up past the upper electrode is a hand lever to operate the clamping jaws. The next photograph, marked "A-4", shows the interior muffler shell in position to receive the first weld, the clamping jaws holding it rigidly and holding the edges overlapped to the desired extent. The next photograph, marked "A-5", shows the muffler shell receiving its second weld. In this photograph, it will be noted, very clearly illustrates the effect referred to by Professor Thomson; in other words, the upper electrode pinches the metal at the joint together so as to localize the current and pressure. The natural spring of the metal between the two welds has forced the two sheets apart. And, the final photograph, marked "A-6", shows the interior muffler tube with the last weld finished and with the jaws open so that the tube can be pulled off. Here also the effect referred to by Professor Thomson is very clearly illustrated, the metal being pinched or squeezed together by the electrodes to thus concentrate the current and pressure. Photographs "A-5" and "A-6" also very clearly illustrate the thinning of the sheets, due to the pressure of the electrodes on the plastic metal, resulting in extrusion thereof, to which I have referred.

Q. 70. State whether or not there is any difference in principle between a method of welding flexible sheets of metal wherein the sheets are first struck up so as to form contacting surfaces to be welded and are then placed between electrodes which localize and pass current at such struck up places, and a method of welding in which flexible plates are struck up by the electrodes themselves so as to form the projecting surfaces to be welded and then are subjected to pressure and current at such surfaces?

A. No, I should say that the processes are identical. In one, struck up projections could be formed as a preliminary operation, and after being formed would concentrate the current and pressure as I have explained, for instance, as suggested by Robinson. In the other, the electrode itself would serve practically as a die to form a projection and the two projections thus formed abutting together would concentrate the heat and current in precisely the same way.

Q. 71. State whether or not there is any substantial difference between the products of the methods or processes set forth in the last question?

A. Not if a substantially pointed electrode were used in each case.

Q. 72. Suppose a substantially pointed electrode were not used in each case, but that the current was localized as well as the pressure at the places of weld by any sort of an electrode, would or would not the products be substantially the same?

A. Of course the product in each case would be substantially the same, but the point I had in mind is illustrated very clearly in the two photographs "A-5" and "A-6", where the metal is shown perceptibly thinner at the welds and bulges up between the welds. I had in mind that if the muffler tube were provided with projections pre-formed in the material and if a flat electrode were used, pressing down along the entire length of the machine, this thinning of the metal might not be so pronounced.

Q. 73. Are you familiar with the practice at defendant's plant, which you call the "Ford Plant", involving the electrical welding of mufflers such as shown in these photographs A-1 to A-6, inclusive, by means of apparatus shown in such photographs?

A. Yes, I spent a week at the Ford plant and frequently witnessed the operation of welding machines for making these mufflers and operated the machines myself, and I also had turned over to me a standard Winfield welder with which I made many experiments.

Q. 74. State whether or not these photographs which you have produced were made by you or under your direction?

A. They were made under my direction from parts representing actual average manufacturing conditions.

By Mr. Arvedson: The testimony of this witness as to the practice of the Ford Company, defendant, is objected to since the witness has not been properly qualified.

Adjourned until 11 A. M., August 5, 1918, at the Office of Fish, Richardson & Neave, 84 State Street, Boston, Mass.

Boston, Mass., August 6, 1918.  
1.30 P. M.

Met pursuant to adjournment.

Q. 75. What does Harmatta's original disclosure have to say about extrusion of metal, area of no weld, relatively cold metal surrounding the place of weld, and electrodes of high conductivity?

A. Nothing whatever. On the subject of extrusion, with the apparatus shown in figure 1 of the original Harmatta's drawings, there will be extrusion or upsetting of the metal around the pointed electrodes and possibly also between the plates. With the form of apparatus shown in figure 4 there will be a thinning of the overlapped edges and consequent extrusion as illustrated on the photograph which I produced at Washington of the practice in making Ford mufflers. As to the second point, namely, the area of no weld, I find in the original description no exact description of the same, since for all that appears to the contrary, the welds produced by the apparatus of figure 5 may overlap. Harmatta made no reference in his original disclosure to relatively cold metal surrounding the weld. This depends to a large extent upon the current used and the time occupied in making the weld. If the weld is made very quickly the metal surrounding it will be of lower temperature than when it is made slowly. This is pointed out very clearly in Patent to Perry No. 670808 to which I have referred heretofore. No reference was made in the original Harmatta disclosure to the use of electrodes of relatively high conductivity.

Q. 76. How, if at all, does the process or method of electric welding involving the use of roller electrodes set forth in the disclosure of the original Harmatta application differ from the process or method of electric welding set forth in the Thompson patent No. 444,928?

A. I see no difference whatever between the two. Both the two sheets to be welded are overlapped and with both two roller electrodes compress the overlapped portion of the sheets between them. Assuming that Harmatta intended to use electrodes of good conductivity then in both current is concentrated by the electrodes so as to heat the adjoining surfaces which overlap and bring the same to the welding temperature. On the same assumption in both the pressure of the two electrodes will consolidate and form the weld. In both there will be the preliminary formation of a spot weld and the subsequent formation of an extended weld. In both the pressure applied to the work will cause the softened metal to extrude since it will be noted that Harmatta in original figure 4 shows the electrode coming to the exact edge at the bottom and practically to the exact edge of the plate at the top.

Q. 77. How does the product resulting from the practice of the process or method of electric welding disclosed by the Thompson Patent No. 444928 compare with the product resulting from the practise of the process or method disclosed in the original Harmatta application involving the use of roller electrodes?

A. Assuming that Harmatta intended to use roller electrodes of good conductivity, the product in each case would be the same, namely, two sheets of metal the overlapped edges of which are continuously welded together.

Q. 78. How does the process or method disclosed by the Lemp patent No. 553923 compare with the process or method disclosed in the original Harmatta application involving the use of roller electrodes?

A. The only difference would be that with the apparatus of the Lemp patent there would not be an extrusion of metal as with the Harmatta original disclosure due to the thinning and displacement of the metal thereby practically extending the overlapped portions. With the device of the Lemp patent the roller electrodes work well within the overlapped edges, so as to be surrounded wholly by metal and such extrusion as there may be will be an upsetting of the metal around the electrodes as is frequently noticed with ordinary spot welding, and possibly also a slight extrusion between the plates which however will be concealed as mentioned in the Burton patent.

Q. 79. How does the product of the process or method of the Lemp patent No. 553923 compare generally with the product of the process or method of the original Harmatta application, involving the use of roller electrodes?

A. The product will be the same except that with the Harmatta roller electrode process there will be an observable extrusion at the edges of the plates where they overlap whereas with the product of the Lemp process there will be no such extrusion.

Q. 80. To affect the electric welding of two superposed metal plates at separated spots by means of electrodes which apply and localize both pressure and current, is it or not necessary that the electrodes be of any particular shape or that they be alike or that both of them be movable?

A. No. Electrodes may be of various shapes so long as they are of sufficiently reduced area to properly concentrate the current. It is not necessary that both be movable and in actual practice with all the spot welding machines I have seen only one is movable. It is not necessary that they should be the same. It is not necessary that both should be of reduced area of contact since perfectly good spot welds can be obtained if one of the electrodes is of considerable area. In fact, it is not necessary that there should be two electrodes at all, since spot welding can be made with only a single electrode the work itself practically constituting the other electrode.

Q. 81. Will you explain a little more fully how the work itself may constitute one of the electrodes?

A. If the welding circuit is completed through the work itself, as for example, by having the work contact with one or more plates, when a single electrode is brought down into contact with the work, the current will be concentrated in the immediate neighborhood of the electrode to bring the metal to the welding temperature and that single electrode will supply the pressure to complete the weld.

Q. 82. Recurring to the Burton patent No. 648694 suppose that the parts to be united by welding are the beveled ends of a metal tire band and that a stationary electrode like that marked 100 and an upper movable electrode having a spherical head like that



numbered 240 are employed, what would be the character of the resulting weld or welds?

A. Each weld will be a separated isolated spot weld between the contiguous surfaces of the work resulting from the concentration of current and pressure affected by the electrode 240. Each weld will be surrounded by an area of non-weld. The extent of that area will depend of course upon how many welds were made. Such extrusion of metal as might be formed would appear as an upset where the electrode dug into the metal.

Q. 83. Do you or do you not understand from the disclosure of the Burton patent that the patentee intended in all cases, to hammer the joint at the point or points of weld to complete the union of the parts?

A. No, the hammering operation referred to is an optional one. The patent does not say that this "must" be done, but states that it "may" be done. The patent does not say that the hammering if employed has anything to do with the welding, but that when it is employed it affects the "finish" of the joint. This finishing of the joint the patent says may be affected not only by hammering but "otherwise." If an electrode such as electrode 240 is used there will be more or less upsetting of metal and the joint could be finished by hammering upon this so as to make the surface smoother. If the joint is to be finished in some other way than by hammering as the patentee suggests it might be finished, for example, by filing. It is quite clear to my mind that with the operation as described by Burton the weld is formed by the concentration of current and pressure by the electrode employed, and when the patent says that "the operator may shove the work forward on the anvil" it means, I think, the work as a whole, or in other words, the parts to be joined have in fact been joined.

Q. 84. Do you find any limitation in Burton patent as to the thickness of material that may be electrically welded according to his disclosure?

A. No, I do not.

Q. 85. During your deposition you have referred to the relative conductivity and resistivity of different materials employed as electrodes in electric welding processes. For the convenience of the court will you spread upon the record the table that may be useful for purposes of comparison?

A. The following resistivity figures are obtained from physical tables issued by the Smithsonian Institution in 1916. The figures indicate the resistance in microhms per cubic centimeter at 0 degrees centigrade:

Copper	1.586
Iron	8.85
Iridium	6.1
Magnesium	4.35
Tin	13.0
Platinum	10.96
Silver	1.46
Tungsten	5.57

Converting these figures into those of relative conductivity on a basis of copper as 100, I find the following:

Copper	100
Iron	17.9
Iridium	26
Magnesium	36.2
Tin	12.2
Platinum	14.4
Silver	108
Tungsten	28.8

The order of conductivity therefore of these metals according to the Smithsonian tables is as follows:

Silver  
Copper  
Magnesium  
Tungsten  
Iridium  
Iron  
Platinum  
Tin

I did not find in the Smithsonian tables the figures for carbon, but in Standard Hand Book for Electrical Engineers, published in 1915, by McGraw-Hill Book Co., Inc. New York City, the statement is made, Section 4-154 that the average value for carbon, at about 3000 degrees may be taken as 720 and for graphite approximately 812, Microhms per cubic centimeter.

Q. 86. Have you or have you not doubt as to the availability of iridium as an effective electrode material for effecting spot welding of metal plates?

A. I have no doubt at all.

Q. 87. What approximately is the present price of iridium?

A. The nominal price is quoted about \$200 per ounce, but it is practically impossible to obtain it.

Q. 88. What was the price of iridium in the years 1889-90?

A. As near as I can tell you from 20 to 40 dollars per ounce.

*Cross-examination* by Mr. STACKPOLE without waiving objections.

X-Q. 89. What is the resistivity of clay?

A. I don't know.

X-Q. 90. Look in the book of Standard Hand Book of Electrical Engineers and see if you can find out?

A. I don't find any clay in the index.

X-Q. 91. How about alumina, which I understand is another name for clay?

A. As I recall it alumina is oxide of aluminum or bauxite. Both of these materials are referred to but no figures are given as to their electrical conductivity or resistivity.

X-Q. 92. Is clay practically a non-conductor?



A. I think it is.

X-Q. 93. Would you call magnesium a good conductor or fair conductor?

A. Assuming the correctness of the Smithsonian Inst. tables, I would call it a fairly good conductor.

X-Q. 94. You wouldn't call it a bad conductor?

A. That depends upon what you use it for. To make a telephone line of magnesium would be poor practice because for that purpose it would be a bad conductor. For spot welding it might be a good conductor.

X-Q. 95. Would you call iridium a good or bad conductor of electricity?

A. The same is true of iridium. It is a good enough conductor to make a spot weld.

X-Q. 96. Could a bad conductor of electricity be made by mixing clay and magnesium?

A. I am not able to say.

X-Q. 97. Could a bad conductor of electricity be made by mixing clay and iridium?

A. That is a very difficult question to answer. If for instance a high tension insulator contained more or less iridium in it, I should say that it would break down on a lower voltage than if it had no metal in it and in that sense it might be considered a conductor.

X-Q. 98. Could a mixture of clay and magnesium be made so that it would have the same conductivity as carbon?

A. I don't know. I never tried it.

X-Q. 99. Could a mixture of clay and iridium be made so that it would have the same bad conductivity as carbon?

A. I don't know. I never tried it. I recall that Mr. Edison about 15 years ago made incandescent lamp filaments out of an earthy oxide with which was mixed metallic particles and he was able in this way to make conductors the resistance of which depended upon the relative proportion of the oxide and those particles. Whether this would throw any light on mixtures of clay and iridium, I don't know.

X-Q. 100. Are you the Frank L. Dyer who testified as an expert witness on behalf of Sebastian Ziani deFeranti in interference between Fernati and the Harmatta patent here in suit on or about November, 1916?

A. I am.

X-Q. 101. In that case you testified that you first became directly familiar with spot welding when you were retained in the present case (the interference case) about a month ago,—that would be October, 1916. Is that substantially correct?

A. Yes.

X-Q. 102. Prior to October, 1916, what experience had you had with spot welding?

A. None at all. What I have learned about spot welding has been learned since. I don't consider spot welding a difficult or mysterious or occult thing at all. It is very much simpler than

operating a sewing machine and requires about the intelligence used in applying a notarial seal to two sheets of paper. I consider myself an expert spot welder at the present time, and I have no doubt that I could get a job as a spot welder.

X-Q. 103. Prior to that time, October, 1916, what experience had you with electric butt welding?

A. No practical experience, but of course for many years I have been familiar with the principles and literature relating to butt welding.

X-Q. 104. Since October, 1916, have your investigations into electric welding both butt and spot been largely if not entirely in the interests of those who are now contesting the Harmatta patent in suit?

A. No, sir. I have made a number of inventions relating to both kinds of welding as well as percussion welding on which applications for patents have been filed, that have nothing to do with the present controversy, either directly or indirectly, and I have carried on a very considerable number of experiments in welding of all kinds having no relation whatever to this controversy.

X-Q. 105. Did you make those experiments before or after October, 1916?

A. Afterwards.

X-Q. 106. When did you first begin to investigate the subject of spot welding for those interested in contesting the Harmatta patent in suit?

A. I tried to familiarize myself with some of the principles of spot welding, as I recall it, immediately prior to the time I testified in the interference case to which you have referred. My actual investigation and operation in spot welding machines was sometime afterwards. I should say possibly a year afterwards.

X-Q. 107. Was that investigation made at the instance of those contesting the Harmatta suit?

A. It was made at the request of a Boston attorney who had charge of one or more suits pending in this District on the Harmatta patents. The attorney I refer to was Mr. Cushman.

X-Q. 108. And since that time you have investigated spot welding on behalf of those interested in contesting the Harmatta patent suit, have you?

A. I have, yes, sir.

X-Q. 109. You have referred in your testimony to the deposition of Mr. Waterman, given in the suit of Thomson Electric Welding Co. et als vs. Barney & Berry, Inc. brought in the District Court of the United States, District of Massachusetts on the Harmatta patent in suit. Is it a fact that in that suit the Thomson patent No. 347140 was offered in evidence by the defendant and explained by the witnesses: Thomson 347141, Benados 363320, Thomson 444928, Thomson 496019, Kleinschmidt 616436, Perry 670808, Ritzel 928701, and German patents to Benados No. 50909?

A. The printed record from which you read so states and I have no doubt that such is the fact.

X-Q. 110. Please merely give me the names and numbers of patents referred to by you on your direct examination which in your opinion describe the same process of spot welding as is described in the Harmatta patent in suit?

A. I cannot do so in fairness to my position. I referred generally to a number of patents to illustrate the extent to which the art had been developed and the degree of engineering knowledge possessed by prior workers in the art before Harmatta, for the purpose of showing that the same principles had been applied over and over again by prior inventors for welding together pieces or plates or whatever the objects might be. My purpose was to show that specifically prior inventors had recognized the feasibility of that particular refinement of resistance welding in which there was a concentration of current and pressure either by forming projections on the work or by the use of electrodes. I don't pretend to say that my review of the prior art is complete in any sense of the word, since whenever a new situation was presented the apparatus was modified to take care of it, but the underlying principles remain the same.

X-Q. 111. In addition to the patents offered in evidence in the suit of Barney & Berry to which I have referred were the following patents among others set up in the defendant's answer: Lemp No. 553923, Thomson 396,015, and British patent to Ferranti No. 11921 of 1903?

A. Such appears to be the case from the printed record before me and I have no doubt such is the fact.

Adjourned.

Boston, Mass., Aug. 7, 1918.

Met pursuant to adjournment.

Appearances same as before.

X-Q. 112. Please give merely the name and number of the patent of the prior art which you regard as the one which best supports your "position" stated in your answer to X-Q. 110?

A. I can't do so because all the patents to which I have referred illustrate engineering knowledge showing the complete familiarity with the principles of resistance welding as would be used for the welding plates together. Of course some of the patents may emphasize certain points that are not emphasized in others. For instance, the Perry patent points out very clearly the fact that when very heavy currents are used so as to form the weld instantly there is very little conduction of heat away from the spot where the weld is produced. And the Lemp patent No. 531197 points out the desirability of using

water-cooled electrodes. And the Burton patent indicates very clearly the absence of apparent extrusion of metal. The Benardos German patent and Thomson patent No. 496019 point out with considerable particularity the making of electrodes of good conductors or poor conductors with the consequent variation in the precise manner of developing heat at the joint to which I have referred. The Thomson patent No. 396015 for example explains how two spot welds can be simultaneously formed concurrently with a riveting operation. The Thomson patent No. 444928 and the Lemp patent No. 553923 indicate how in addition to forming a spot weld, a continuous or limited extended or line weld can be obtained between the overlapping ends of two sheets. The Robinson patent No. 574942 and the Rietzel patent No. 982071 emphasize the making of the spot welds or "small welding spots" as Robinson calls them, by the formation of projections on the work. Parkinson's British patent emphasizes the making of two spot welds for holding a glut in position in a wheel frame. I have therefore considered all these patents together as indicating the very complete development of the art of spot welding; just the same as if an authoritative book had been written on the subject I would consult the entire book to find out about it.

X-Q. 113. Now referring to the Thomson patent No. 396015 for method of electric riveting, does this patent describe any method of uniting sheets or metal in which a rivet is not used?

A. It described spot welding only in connection with or as an adjunct to riveting.

X-Q. 114. Can't you answer my question yes or no?

A. Surely. I tried to make my answer definite, but if you want a categorical answer I say no.

X-Q. 115. Does the Thomson No. 396015 describe any welding of the plates except "immediately surrounding the rivet". Please answer categorically if you can.

A. I cannot answer the question categorically or at least a categorical answer would not be sufficient. The patent says: "In some cases I may cause the electric current to flow across from piece to piece of the parts to be riveted", and in Figs. 9 and 10 the electrodes which concentrate the current and pressure (said electrodes being indicated by the reference letters K, K1 and K2) are shown as considerably separated, so the resulting spot welds will be correspondingly isolated and separated by considerable areas of non-welding. Therefore, when the patent states that "the plates immediately surrounding the rivet" are brought "to the welding temperature" I turn to the drawing to see what Prof. Thomson meant by the word "immediately" and find that he had in mind the production of spot weld in the plates some distance away from the rivets.

X-Q. 116. Does any figure of the Thomson patent No. 396015, which figure illustrates the completed weld, illustrate any

welding of the plates except immediately surrounding the rivet? And if so, which figure? Please answer categorically if you can or give merely the number of the figure.

A. Figs. 9 and 10 illustrate the formation of two spot welds diametrically with respect to the rivet and at some distance from the rivet.

X-Q. 117. Perhaps you did not notice that my question was limited to the figures in which the completed weld is illustrated. Do any such figures illustrate any welding of the plates except immediately surrounding the rivet?

A. Surely, Figs. 9 and 10 show this very thing. Prof. Thomson in describing Fig. 9, for example, states that when the small insulator blocks  $m$   $m'$  are used the purpose of the clamps would be to hold the plates together but that by omitting these insulator blocks "a heating electric current might be passed through the metal plates themselves, at parts around the rivet," which current will "assist in raising a portion of the plates immediately surrounding the rivet to the welding temperature."

X-Q. 118. Does any one of the figures 5, 6, 7 or 8 of the Thomson patent 396015 illustrate any welding of the plates except immediately surrounding the rivet?

A. No. The particular products illustrated in Figs. 5, 6, 7 and 8 are obtained by using electrodes of the form shown in Figs. 1, 2, 3 and 4. What I have been trying to emphasize is the particular product formed with the apparatus of Figs. 9 and 10.

X-Q. 119. Does either Fig. 9 or 10 of the Thomson patent No. 396015 illustrate the completed weld?

A. No. They show the apparatus in position to make the welds, assuming that the insulators  $m$   $m'$  are omitted in Fig. 9 as Prof. Thomson states may be done. Of course as soon as this current is turned on the two welds are formed in the lines of the opposing electrodes. I direct your attention to the fact that in Fig. 10 these insulators are omitted and the electrodes are directly in contact with the plate.

X-Q. 120. Is it your understanding that piece  $K^2$  shown in Fig. 10 of the Thomson patent No. 396015 bears upon the plate  $P$  all around the rivet or only at two places?

A. I have assumed that Fig. 10 shows an arrangement in which two electrodes are used bearing on the plate  $P$  at two places since Prof. Thomson states that this figure "shows a modification of the just-described apparatus" of Fig. 9 which clearly shows that such is the case.

X-Q. 121. In the apparatus as shown in Fig. 9, Thomson Patent No. 396015 how was the piece  $K$  that you have called an electrode set up against the plates or work so as to clamp them together?

A. The patent states that this may be done by means of a "screw  $S$ ".

X-Q. 122. Are the threads of the screw  $S^1$  shown on Fig. 9?

A. Threads are shown in dotted lines in Fig. 9 which may be the threads of this screw. Of course the provision of means for actuating the so-called clamping devices or electrodes is a matter of very simple mechanical skill. Fig. 1 shows another arrangement.

X-Q. 123. Suppose we take the apparatus just as it is shown in Fig. 9 and remove the mica pieces  $m$   $m^1$  would it be necessary to set up the screw piece marked  $S^1$  in order to clamp the work between the pieces  $K$   $K^1$ ?

A. Yes.

X-Q. 123. When that was done would the prongs of the clamp  $K$ , which you have called electrodes, necessarily come opposite the prongs of the clamp  $K^1$ ?

A. If the prongs  $K$  are integral with the screw  $S^1$  the prongs  $K$  would come opposite prongs  $K^1$  or substantially so, if the apparatus were built to accommodate plates of a definite thickness. But the patent does not state that the prongs  $K$  are, in fact, integral with the screw  $S^1$ , and I have assumed that they are not, nor do I believe that a person of Prof. Thomson's intelligence would so make them. He would make these prongs separate from the screw as shown in Fig. 1, so that when the screw turned the prongs would simply move in a straight line.

X-Q. 124. Suppose by turning the screw  $S^1$  the prongs  $K$  come at right angles to the prongs  $K^1$  when the work was clamped between the two sets of prongs. Under those conditions would the current flow from the prongs  $K$  through the sheets to the prongs  $K^1$ ?

A. Current would flow, but what would happen I do not know. I have considered the patent with the apparatus as illustrated, namely, with the electrodes in line with each other and not at right angles as you suppose in your question.

X-Q. 125. Under the circumstances supposed in my last question do you think that there would be spot welds formed remote from the rivet?

A. I am not able to say.

X-Q. 126. Point out by page and line merely the statement in the Thomson patent No. 396015 which describes the further setting up of the clamp pieces  $K$  of Fig. 9 after the passage of the current has been begun.

A. I do not find any specific statement in the patent in connection with Fig. 9 that after the welding current is applied the clamping pieces or electrodes are further set up, but Prof. Thomson does state that these devices "may be forced hard against the plate  $P$   $P^1$ " and I have no doubt that if further pressure were desirable Prof. Thomson knew perfectly well, and any one familiar with the art knew full well, that it could be applied. However, with this apparatus further pressure would not be necessary because the inherent expansion of the

metal under the effect of the heating current, as Mr. Gravelle has pointed out, would inevitably result in the formation of the weld. Of course in Fig. 10 pressure is continuously applied to the electrodes by the springs s.

X-Q. 127. Figs 6 & 7 of the Thomson patent No. 396015, are the only figures illustrating a completed weld in which there is a welding of the plates?

A. These are the only figures of the patent illustrating pictorially or by means of actual lines the weld between the plates. Figs. 9 & 10 illustrate the weld in precisely the same way that Harmatta does, namely, two plates engaged by opposing electrodes. The Thomson specification contains a perfectly clear mental picture of the welds made by the apparatus of Figs. 9 and 10.

X-Q. 128. As you just said, I believe, that Figs. 6 & 7 of the Thomson patent No. 396015 are the only figures illustrating completed welds will you state categorically, if you can, whether either of these figures show a weld between the plates which is not integral with a portion of the rivet?

A. I don't understand what you mean by a weld that is integral with the rivet. If you mean that the rivet is welded into the metal through which it passes, this is shown in Fig. 6. In Fig. 7 the continuity of the rivet appears to be preserved and the weld is formed between the plates.

X-Q. 129. It seems to me that the lines in Fig. 7 which indicate the rivet, are broken so as to leave a space in the middle of the plates. Do you agree to that?

A. This may be, but as I look at the Figure I thought the intention was to show the rivet in broken or dotted lines.

X-Q. 130. Is that still your view?

A. I don't know that I ever had any particularly set view as to the riveting feature of this patent, as my attention was centered on its spot welding feature. It is perfectly conceivable to me that the rivet may substantially preserve its identity as clearly shown in Figs. 5 & 8, or it may lose its identity and become merged with the adjacent metal as clearly shown in Fig. 6. I assumed that in Figs. 7 it had preserved its identity, but there is no reason why it in turn should not be merged with the adjacent metal. It is all a question of heat, and, of course, the metal of the rivets.

X-Q. 131. Do Figs. 5 & 8 of the Thomson Patent No. 395015 show the plates or sheets welded to one another?

A. Apparently not.

X-Q. 132. Referring now to Fig. 10 of Thomson patent No. 396015 how do you understand that the current of electricity is led into the piece K<sup>2</sup>?

A. Either through the plunger G or by a separate connection or in any other way that the designer might construct the machine to prevent waste of current.



X-Q. 133. How is the plunger G of Fig. 10 guided, if it is guided at all?

A. Fig. 10 simply shows a modification of the clamping head or electrodes. It is referred to as a modification of Fig. 9 which shows the electrodes carried by "a common bed or support B<sup>1</sup>." Such a bed also is shown on Fig. 1 and marked C C<sup>1</sup>. I assume that it is guided or supported in the bed or support in any of the obvious ways, for instance, as shown in Fig. 1. In other words, the electrode G of Fig. 10 corresponds to the electrode G of Fig. 1 being additionally provided with the two electrodes and the spring for imposing pressure thereon.

X-Q. 134. Do you think that Fig. 10 shows a single piece K<sup>2</sup> or more than one piece?

A. Two pieces as in Fig. 9, constituting two pair of opposed electrodes.

X-Q. 135. Now turn to patent No. 444928 to Thomson. Is the weld described in this patent as being made by the apparatus of Figs. 1, 2 & 3 a weld between the overlap of the edges of two sheets of metal?

A. In Fig. 1 the weld is formed between the overlapped edges of two sheets of metal. In Figs. 2 & 3 the edges may be overlapped or they may not be overlapped, depending upon how the plates are put together and where the weld is made. Prof. Thomson states that the invention relates generally to the joining or welding together of strips, sheets, etc., "where it is desirable to form a joint of considerable length" and then he indicates as a specific or desirable practice the "welding of plates together at their edges." I notice in glancing through the claims that the 5th claim for example refers to the passage or delivery of the current "through surfaces *near* the edge of the work" which would imply within the edge.

X-Q. 136. Describing the operation shown on Fig. 1 the Thomson patent No. 444928 says, page 1, lines 84 to 94, "The edges are slightly overlapped, as shown, and the plates, being in position between the rows, may be squeezed together by means of the screw S thus forming an electric contact between them. The electric current being now turned on as it passes from one roller to the other, and across the point of pressure will heat the work to the welding temperature and soften the same slightly, after which the screw may be given a few more turns to effect a solid union?"

Does the patent describe a further manipulation of the screw as the work is moved along through or between the rollers?

A. No.

X-Q. 137. Figs. 1, 3 & 3 show rollers of different diameters, do they not?

A. Figs. 1 & 3 show rollers of different diameters. Fig. 2 shows segments. The relative scale of the drawings is not indicated.



X-Q. 138. Do you understand that the process described and the result obtained would be materially changed by a change in the diameters or radius of the rollers?

A. I see no reason why within limits, there should be any difference in the process or product by changing the diameter of the rollers. Of course they should not be too small or too large; what the limits are I do not know. I have made such welds with rollers of different diameters, varying from between two to three and a half inches, as I recall.

X-Q. 139. Suppose the rollers were as large as 10 in. in diameter would the process and product be the same?

A. Of my own knowledge I don't know, but I see no reason why there should be any difference provided the proper current is used.

X-Q. 140. Considering the apparatus as shown in Fig. 1 of the Thomson patent No. 444928 and with the edges of the sheets overlapped as shown in that figure, what difference would there be in the process and in the product if the bearing faces of the rollers were increased in width? By bearing faces I mean the entire width of the flat periphery and not merely the portion of that periphery which bears upon the work.

A. Of course I do not see any need of extending the width of the faces of these rolls, but if this is done I do not see that it changes the process or product.

X-Q. 141. Suppose the operator of a roller welding machine operating as shown and described in this Thompson patent No. 444928 runs the machine at exactly the right speed to make a good weld and then suppose on the next piece of work he runs it materially slower, what would be the effect on the work, other conditions remaining the same?

A. What metal is assumed to be used?

X-Q. 142. Take steel sheets.

A. The welding range of steel is quite extensive. If in the first case the speed was calculated to make a weld as nearly as possible to the lowest temperature point, then a substantial diminution in speed without cutting down the current might have no important effect except possibly to produce more extrusion. But if in the first case the operator was working at a speed to give a welding heat near the maximum then a substantial reduction in speed without a proportional decrease in current might burn through the plates.

X-Q. 143. And if the operator increased the speed of the feed of the plates between the rollers what effect would that have?

A. Of course if the operator made the speed so high as not to allow time for the weld to form, then no weld would form. The same is true with all welds; sufficient time must be allowed for the metal to reach the welding temperature.

X-Q. 144. About what is the welding temperature of common, ordinary low carbon commercial steel?

A. That of course is given in the books. My recollection is between 1200 to 1500 C.

X-Q. 145. What is the melting temperature of tin?

A. About 230 degrees centigrade.

X-Q. 146. What is the melting point of magnesium? ?

A. According to the books about 650 degrees C.

X-Q. 147. Referring to the Thomson patent No. 496019 for electric soldering is the tin between the surface of the plates melted as the process is described in the patent?

A. Yes.

X-Q. 148. Do you recognize a well defined difference in principle between electric welding by what is sometimes called the electric resistance process, wherein the pieces are brought to welding temperature by the development of internal heat in them and an electric soldering process such as is described in the Thomson patent No. 496019?

A. No. I recognize no distinction in principle between the two, but regard the principle of one as precisely the same as the principle of the other, namely, the development of heat electrically in the neighborhood of the contiguous parts to be joined. I grouped the two processes in the same way that they are grouped by the Thomson Co., for instance in the Lemp patent No. 553923 which states that the invention relates to "welding, soldering, cementing or similar operation." The only difference is the necessary adjustment of current and time to secure the desired heating principle.

X-Q. 149. Do you recognize any well defined difference in principle between such electric soldering as is described in the Thomson patent No. 496019 and a soldering process in which the heat is developed in an exterior mass such as a carbon electrode, and that electrode is applied to the back of the work?

A. As I understood your question, that is precisely what Prof. Thomson proposes in his patent No. 496019, at least as one of the modifications of his method. Of course, as the resistance of the exterior electrode is reduced less heating effect is secured by that means and more heating effect is secured interiorally by the resistance of the work. The two things merge into each other, and it is impossible to say that a clear line of distinction exists between them. As I have pointed out in my direct examination, even with copper electrodes they frequently get very hot and frequently also energy is expended at the contact between the electrodes and plates.

X-Q. 150. According to a printed copy of your testimony in the Ferranti-Harmatta interference you are reported (X-Q. 30) to have testified as follows: Do you recognize a well defined difference in principle between electric welding by the what is sometimes called the electric resistance process, wherein the pieces are brought to welding temperature by the development of internal heat in them and an electric soldering process, such as that which may have been witnessed by you as you now state?

A. I recognize fundamental distinctions between a process in which heat is developed by the internal resistance of the metals to be joined and that in which heat is developed in an exterior mass such as a carbon electrode? There is, of course, a distinction between electric welding in which the surfaces to be joined merely reach a condition of plasticity and electric soldering in which a metal having a lower melting point is actually melted and becomes liquid, but the two processes may be very closely allied. If, for example, the separate pieces C<sup>1</sup> shown in Figure 5 of the Rietzel Patent were properly chosen with respect to melting points of the plates to be joined, I should say that such a process would be electric soldering or brazing. Have I quoted correctly from your testimony the entire X-Q. 30 and your answer thereto?

A. You have.

X-Q. 151. Referring to the Robinson patent, No. 574942, what are the projections lettered which are welded to the rail?

A. On the girder plate B they are the "slight upward projections or contact points d". On the fish plate C they are the "projections i".

X-Q. 152. Do you think there would be any practical difficulty in welding the projection d to the bottom of the rail?

A. No, I don't think so.

X-Q. 153. Do you think there would be any practical difficulty in welding the projections i to the rail?

A. I think not. What Robinson proposes is the same in effect as what Rietzel proposes in patent 928701, and I have no reason to question the complete success of such a process.

X-Q. 154. I suppose you have tried the Rietzel process, haven't you?

A. I have tried substantially the same thing as the Rietzel process, namely, where the projections are concurrently formed by the electrode itself. I have reference to the practice of an operation similar to that illustrated in the photographs which I introduced at Washington where the pressure of the electrode forces down the metal at the edge to thereby form a projection, or, as Prof. Thomson described the operation, where the electrodes pinch the metal.

X-Q. 155. As I understand you have not practiced welding with prepared plates or projections as shown and described in the Rietzel patent No. 928701?

A. No.

X-Q. 156. Have you ever tried the welding operation described in the Robinson patent No. 574942?

A. I have never tried that but I have made enough experiments and tests to satisfy myself that what Robinson says in his patent as to the operation is correct; that is to say, as near as anything can be determined *a priori*.

X-Q. 157. What becomes of the metal of the projections in the process described in the Robinson patent?

A. The same thing as Figs. 3 and 4 of the Reitzel patent; that

is to say the metal is displaced, and the amount of that displacement or thinning depends upon the amount of metal in the projection.

X-Q. 158. Can you tell me where the metal goes to?

A. Like all softened metal when it is subjected to pressure it flows in the paths of least resistance. If the electrodes pressing upon the girder bar or fish plate are flat, as with Reitzel, the flow will be between the plates, and the extent of that flow will depend upon the plasticity of the metal and the pressure applied.

X-Q. 159. Do you mean that the flow of the metal of the projections is sidewise, so to speak; that is, the projections are squashed out in the Robinson process?

A. Yes, and the amount of squashing, to use your term, would depend upon the amount of metal in the projections.

X-Q. 160. What were the experiments which you have referred to on which you based your opinion of the practicability of the Robinson process? When and where were they performed and with what materials?

A. I have performed many scores, if not hundreds, of spot welding operations, with National spot welding machines at Warren, O. I spent an entire week at Detroit, at the plant of the Ford Motor Co., operating the Winfield machine. I have also performed spot welding operations with Toledo machines at the plant of the Empire Cream Separator Co., at Bloomfield, N. J. I have built a spot welding machine myself which I have operated many times for the making of spot welds. All of this was subsequent to October, 1916. I have used copper electrodes, steel electrodes, Tungsten electrodes, and Iridium electrodes. I have used electrodes of many shapes, some conical with blunt points, some with comparatively sharp points, some long like pointed lead pencils as shown by Harmatta, some flat. I have also used roller electrodes with narrow faces and wide faces, and I have also used roller electrodes with teeth cut in their periphery so as to form a succession of isolated welds instead of continuous welds. I have welded iron plates of varying thickness, steel plates, copper sheets, nickel plates to iron bars, and have done actual practical welding of stock material such as the manufacture of cooking utensils prior to enameling and also shells for resistance boxes. I have also used carbon electrodes and graphite electrodes and electro plated carbon electrodes. In all of this work I never failed to observe that the welding current when confined to a small path would be concentrated, resulting in the production heat and if there is sufficient current to bring the parts to a welding temperature a weld would be formed under pressure. I have also operated butt welding machines at the plant of the National Co. at Warren, O., and have observed the same thing. I neglected to say that I built a butt welding machine myself to carry on certain work having no connection with this case, and with which I also carried out so-called percussion welding. Because of the observations which I have made I have no doubt that, as

suggested by Robinson, the projections i or d, as the case may be, will result in the formation of "small welding spots" as he described them in his patent.

X-Q. 161. Were these experiments, to which you have referred in your last answer, with the exception of the last mentioned butt welding machine, made on behalf of the interests who are contesting the Harmatta patent?

A. The observations which I made at Warren, O., were made on behalf of the clients of Mr. Cushman, whose names I have forgotten. The observations which were made at the Ford plant were made for the present defendant. The observations which I made at the Empire Cream Separator Co. were made, I suppose, largely as a matter of personal curiosity; I am a stockholder in that company and took occasion while visiting the plant to operate their welding machines.

X-Q. 162. Is the Empire Cream Separator Co. a member of the Welding Patent Investigating Committee?

A. That I don't know.

X-Q. 163. I gather from your answer about your experiments that you have not made experiments on welding pieces of metal together, on one of which pieces there are one or more projections which are welded to the other piece? Am I right in that understanding?

A. I just happened to think that in experimenting with steel electrodes which do in fact constitute points to concentrate the current a weld would be formed between that electrode and the plate, but quite apart from this observation, and if I had not observed it I would still be confident that currents can be concentrated as suggested by Robinson. I can't say that I have actually taken two plates of metal, one or both being formed with projections, whereby the current would be concentrated and obtaining the weld in this way.

X-Q. 164. According to the Robinson patent how many of the projections are welded at the same time to the rail?

A. That depends, of course, upon how many projections there are. Enough would be used to make a sufficiently strong joint, and that would depend upon the use to which the process is applied. Robinson shows in Fig. 1 three projections d on the girder plate for welding the same to the rail, and he shows six tapered projections i on the fish plate for welding the same to the side of the rail. Robinson in his patent does not say that any particular number of projections must be used.

X-Q. 165. Do you understand from the Robinson patent that all projections d, namely 3, or all the projections i, namely 6, are welded to the rail in one operation?

A. I understand that the projections d on the girder plate are welded at one operation and that the projections i are all welded at another operation.

X-Q. 166. In your welding experience what was the largest current used by you in amperes?

A. I don't know. I used a sufficient current to make a spot weld in a very short time. In operating my own spot welder I used a current between 2500 and 3000 amperes and less.

X-Q. 167. How big a spot weld was the largest spot weld that you ever made and how thick were the sheets?

A. I made no effort particularly to make large welds but as I recall they averaged when pulled apart possibly  $3/16$ ths of an inch in diameter. Most of my work was with rolled steel .020 of an inch in thickness, but I used some thicker material and some thinner.

X-Q. 168. What was the maximum thickness of the sheet?

A. When I welded a cold rolled steel plate about  $1/32$  of an inch thick to a half inch bar.

X-Q. 169. And made a weld of what size or diameter?

A. My recollection is that an ordinary copper electrode was used such as employed in standard spot welding and I should suppose the spot weld would be the usual diameter, but I did not pull the plates apart to measure. My observation of ordinary spot welds is that they are about  $1/8$  of an inch or  $3/16$ ths of an inch in diameter.

X-Q. 170. How large was the current in amperes which was used to make this weld?

A. All the current I could get through the Winfield welder, but I don't know the number of amperes.

X-Q. 171. Can't you give me an estimate of the amperage of the current?

A. No, I can't. I should say it was somewhere between 2500 and 4500 amperes.

X-Q. 172. Is that the largest current you ever used in your experiments?

A. No. I don't know what the largest current was, but one of the machines I operate at the plant of the National Co. was a very large spot welder, the upper electrode being pulled down by either a hand lever or a foot lever, and the great quickness with which that machine made a spot weld convinced me that a heavy current was passing, although I did not measure it. The current of course determines the time of welding. The greater the current the less the time provided that other things were equal such as thickness of plates and pressure.

X-Q. 173. Can you give me an estimate of the amperage of the current used in the machine referred to at the National Co.?

A. No, I cannot. It would simply be guessing.

X-Q. 174. How thick were the sheets in which the weld was made with this machine?

A. As I recall about 20 thousandths.

X-Q. 175. What was the size of the weld made?

A. My best recollection is that ordinary standard spot welding electrodes were used, which would make the weld in the neighborhood of an eighth of an inch. I don't think that I ever made an attempt to caliper these welds, and my answers as to their size is the dimension I have carried in my mind.

X-Q. 176. Did you in your experiments ever measure the amperage of the currents used?

A. Yes. I have previously stated that in operating my own machine I used currents up to between 2500 and 3000 amperes. I know that I succeeded in burning most of the insulation off the secondary leads. I made no particular attempt in any of these experiments to measure exact quantities of current. My idea was to familiarize myself with the practical operation of spot welding machines. These machines are almost always provided with some sort of an arrangement for varying the voltage, and when a weld is not properly formed at a low voltage the practice is to increase it somewhat and try again.

X-Q. 177. Do you recognize any difference in principle between the process described in the Robinson patent 574942 and that described in the British patent Ferranti No. 11921 of 1903?

A. Offhand I must say that I see very little difference in principle between the two except that in the case of Robinson it appears very clearly that pressure is applied to force the two pieces of the work together whereas with Ferranti the turbine blades are apparently welded to the projections which more or less preserve their identity.

X-Q. 178. Does this distinction apply to Fig. 14 of Robinson patent and also Fig. 18 and Fig. 20?

A. Yes. In Robinson patent the fish plate is shoved in as far as it will go, fitting between the foot and the head of the rail. Of course the two plates (viewing the web of the rail as one plate and the fish plate as another plate) are not pressed into intimate contact. The amount of their separation depends upon the amount of metal in the projection. If there is very little metal in the projections then the plates will come more closely together.

X-Q. 179. In the process described in the Kleinschmidt patent No. 616436, how many sheets or plates are welded together at one operation?

A. Viewing the web of the rail as one plate, then three plates are welded together the same as in Fig. 10 of the Rietzel patent.

X-Q. 180. Does the Kleinschmidt patent describe the welding together of only two plates?

A. Apparently not. Kleinschmidt in his patent evidently proposed to use a splice bar on each side of the rail so as to make a very strong joint.

X-Q. 181. What becomes of the metal of the projection or boss b in the finished Kleinschmidt weld?

A. The patent says: "The bosses b extend only a very short distance from the main body of the bar, so that they will not prevent the bar from making close engagement with the rail and so that any tendency which they may have to bulge out will be prevented by the rapid cooling and compression to which they are subjected." To what extent the metal may be compressed I am not able to say as I have made no observations on that point, but



if there is sufficient metal in the bosses I should say there would be slight extrusion between the plates. This might be microscopic. I have observed it in spot welds.

X-Q. 182. Coming now to the Burton patent, No. 647694, it appears to me that in Figs. 1, 2, 6, 7, 8, 9, 10, 11 and 12 that the end of the two pieces or the two pieces themselves are not in contact with each other as shown. Do you agree to this?

A. That seems to be the draughtsman's way of illustrating the fact that there are two pieces.

X-Q. 183. May I take it that your answer is in the affirmative?

A. As a matter of illustration, yes. But as a matter of common sense, no.

X-Q. 184. As shown in Fig. 2 will some of the current pass from the electrode 210 to the electrode 100 through the work without crossing the joint?

A. In Fig. 2 the work is shown as a tire which, of course, is completely circular. The upper electrode is also curved to make contact with the tire throughout its face. The bottom electrode 100 is flat. Therefore the work engages the bottom of the electrode at a single line coincident with the joint, and the resulting weld, therefore, would be a line of welding extending across the joint, the current in this case being concentrated by reason of the peculiar shape of the work instead of by the shape of the electrodes.

X-Q. 185. In Fig. 2 do both ends of the work come in contact with the upper electrode 210?

A. The electrode No. 210 engages the work on both sides of the joint.

X-Q. 186. In Fig. 2 are both ends of the work in contact with the lower electrode 100?

A. No, the work is curved as I explained, and therefore engages the lower electrode at only a single line, namely, near the end of the section at the left.

X-Q. 187. In Fig. 1 are both ends of the work in contact with the upper electrode?

A. I think Fig. 2 is intended to show the same thing as Fig. 1 on a larger scale.

X-Q. 188. In Figs. 7 and 8 is the upper electrode in contact with both pieces of the work?

A. I think so.

X-Q. 189. Is the same true of the lower electrode in those figures?

A. Yes.

X-Q. 190. In Figs. 9 and 10 are both the upper and lower electrodes shown as bearing upon the work throughout their length?

A. Apparently this is so.

X-Q. 191. In Figs. 11 and 12 are both the upper and lower electrodes each in contact with each end of the work or with the two pieces of the work, whichever way it may be?

A. Yes.



X-Q. 192. Is Fig. 13 the only figure of the patent which shows two sheets overlapped as distinguished from two sheets scarfed over each other?

A. If you make any real distinction between overlapping and scarfing, which I do not admit, that is true.

X-Q. 193. Is Fig. 13 the only figure which shows the sheets united with a rivet?

A. Yes.

X-Q. 194. How is the hole in Figs. 3 and 4 countersunk by the electrode 210?

A. The electrode concentrates the current around the hole so as to soften it, thus permitting the electrode to be shoved down into the softened material to enlarge the hole or produce a countersink therein.

X-Q. 195. Would this make the hole smaller below the action of the electrode?

A. If a sufficiently heavy current were used to locally soften the metal I should think that countersinking could be performed in this way although it would produce an upset. I believe the workman could do this without affecting the diameter of the hole at the bottom. Of course if he worked very slowly with too little current he would probably make a bad mess of it.

X-Q. 196. What uses are specified by the Burton patent for the specific electrodes 220, 230, 240 and 260, shown in Fig. 1?

A. Burton intended to provide an apparatus capable for general metal working, and the patent points out a large number of things that could be done with it. It says that the electrodes are "of different shapes adapted for different purposes." Electrode 220 appears to be a disc with a flat face and might be conveniently used for brazing for which the apparatus is described as being adapted. Fig. 230 shows an electrode in the form of a channel and might be used, for example, for welding the two flanges of the tire shown in Fig. 6. Electrode 240 is clearly shown as spherical for concentrating the current, and if used as described by Burton would indisputably produce a spot weld in overlapping plates. Electrode 260 appears to be a flat rectangular electrode suitable for welding straight channels instead of curved channels in Fig. 2. Same reference number 260 in Fig. 2 appears to show the specific electrode of Fig. 7. The whole apparatus is intended to present to the blacksmith or other metal worker a box of tools so to speak which he can make use of for carrying out many different kinds of welding operations.

X-Q. 197. Confining your answer to the uses specified in the patent of your electrodes 220, 230, 240 and 260 shown in Fig. 1 do you find any reference to the use of these electrodes, or any of them, than that which you have already quoted which refers to "a plurality of radial arms, as 210, 220, 230, 240, 250 and 260, said arms carrying electrodes of different shapes adapted for different purposes?"

A. Yes. I find that Burton states in describing the welding of overlapped piece that "one of the electrodes of the electrode head is brought into contact with the work" from which I understand that any one of these electrodes which the operator might select. And if the electrode 240 is selected, then, as I have described, a spot weld will be produced.

X-Q. 198. And you have quoted from the Burton patent all that you find with reference to the electrodes No. 220, 230, 240 and 260?

A. Yes.

X-Q. 199. Referring now to the Parkinson British patent No. 14536 of 1894 what is the function of the two die pieces b b<sup>1</sup>?

A. Apparently these die pieces are used to prevent any metal from extruding between the glut pieces and wheel so that the glut pieces will always occupy a fixed relation with respect to the circumference of the wheel.

X-Q. 200. These die pieces when in their thrust out position and the adjacent portions of the spokes form a closed die into which the glut piece is compressed by the hydraulic ram? Is that so?

A. Yes, and when the glut is thus held in place the current localized by the two electrodes L forms the two welds.

X-Q. 201. Why does Parkinson employ the cap pieces or clamps L<sup>1</sup>?

A. To somewhat extend the length of the electrodes, the purpose being stated in the patent to be "to fit the radius of a larger wheel C<sup>1</sup>."

X-Q. 202. The patent provides for the application of 8 glut pieces. Do you understand that these are all welded at the same time?

A. I think the patent contemplates either the formation of all welds simultaneously or separately. For instance, it says: "The invention consists essentially in constructing the apparatus with one or more alternating or continuous current transformers or generators working in conjunction with a number of hydraulic cylinders and rams, the transformers or generators being connected with the bed plate or support upon which the articles are placed, so that the current passes through that part of the article or at the point which is required to be treated, and maintains it at the desired temperature whilst the hydraulic rams compress it and effect the welding." Then the patent says that the apparatus "may be varied to suit different forms of work" (page 4, line 5) and continues: "In the construction of the machine several transformers may be employed placed diametrically opposite each other the secondary circuits of which are directly connected to the work in hand thus separate transformers can be applied to different parts to be heated."

X-Q. 203. Of what material is the contact block M?

A. The patent does not state, so far as I can see, but the expression "contact block" would mean I think a block in which good contact was desirable so that the metal would be selected from that viewpoint.

X-Q. 204. Do you regard copper as a likely material?

A. Yes.

Adjourned to 9:30 August 8, 1918.

Boston, Mass., August 8, 1918.

9:30 A. M.

Met pursuant to adjournment.

Counsel present as before.

*Cross-examination continued.*

X-Q. 205. Referring now to the Perry patent No. 670,808, what is the work which is described as being welded? Please indicate it by reference letter and state of what it consists.

A. Perry in Figs. 4 and 5 for example, shows the welding together of two crossed wires which may be galvanized wire, or iron wire covered with a coating of zinc (page 1 lines 81-82) and in Figs. 6 and 7 two balls are shown as being welded together. The patent does not state specifically what the metal of the balls is although it indicates possibly by implication that these balls also are coated with metal.

X-Q. 206. According to Perry are the rods or the balls united throughout their contacting surfaces?

A. Yes.

X-Q. 207. Referring now to the German Patent 50,909 to Benardos do you understand that the operation intended to be carried out by the apparatus of Fig. 1 is a soldering operation or a true welding operation, bearing in mind the distinction between soldering and welding?

A. From the translation of the Benardos patent which has been furnished me, a copy of which has been furnished cross-examining counsel, I understand Fig. 1 to represent a true welding operation in which the metal of the plates at the joint is welded rather than a soldering operation in which the joint is formed by uniting metals of lower melting point.

X-Q. 208. Referring still to Fig. 1 of the Benardos German patent at what part of the electric circuit is the heat developed for this purpose?

A. Within the electrode itself w, at the point of contact between the electrode and the plate A<sup>1</sup> and at the joint between the two plates.

X-Q. 209. In the apparatus shown in Fig. 1 of the German Benardos patent does the current cross the joint between the plates A and A<sup>1</sup>?

A. Not in the apparatus as specifically shown but the patent states that "In certain cases, however, it may be of advantage to

make the backing support of the work which resists the pressure of the tool, of material (metal) which conveys heat away rapidly." When such a metal backing is used I assume that one of the secondary leads would be connected with it, and when that is done the current will pass through the joint as in Fig. 2 of the Benardos patent.

X-Q. 210. By "Secondary leads" do you mean the wire from the secondary of a transformer?

A. Yes.

X-Q. 211. Quote from the Benardos patent any description contained therein of the use of the transformer?

A. The patent refers to "a powerful source of electricity of low internal resistance" which I would understand to be either the secondary of a transformer or a generator of current of low voltage. The patent does not specifically use the expression Transformer.

X-Q. 212. Taking the apparatus as is shown specifically in Fig. 1 of the Benardos patent, in which the current does not cross the joint between the plates A and A<sup>1</sup> is any heat developed at the joint by the current?

A. Only indirectly by conduction.

X-Q. 213. Conducted from what as a source of heat?

A. Conduction from the electrode w and from the surface of the plates A<sup>1</sup> where heat is developed by the resistance of contact between that electrode and the plate.

X-Q. 214. Throughout the patent the electrodes referred to as w, w', w'' are described as bad conductors or poor conductors or words to that effect, are they not?

A. That appears to have been Benardos preferred arrangement although in the first paragraph he refers to materials which are relatively good conductors or at least to arrangements in which there will be less disparity between the resistance of the electrodes and the resistance of the work, and which when used will result in the development of more heat in the work itself.

X-Q. 215. Have you read the German text of this patent?

A. I do not understand German sufficiently to enable me to pass upon the patents in that language. Yes, I have read it but cannot say I understand it from the German.

X-Q. 216. In testifying concerning this German patent you have relied on the translation furnished by counsel for defendant and heretofore referred to by you?

A. Yes, and also as I recall from the translation of this patent appearing in the record of the Barney & Berry case.

X-Q. 217. Do you know who made the translation furnished by defendant's counsel in this case?

A. Only by hearsay. I was told by Mr. Church that it was made by Mr. Coombs of Washington.

X-Q. 218. Did you ever talk with Mr. Coombs concerning the disclosure of this German patent?

A. No.

X-Q. 219. Do you know enough German to know that the German word "mit" means with?

A. Yes.

X-Q. 220. Do you know enough German to know that the German word "löth" means solder?

A. No.

X-Q. 221. Do you know enough German to know that the German word "arbeit" means work?

A. No.

X-Q. 222. In your consideration of the Thomson No. 444,928 have you assumed that the rolls R and R' are of copper?

A. Yes. They are described as of "conducting material."

X-Q. 223. As shown in Fig. 1 of the Thomson patent 444,928 each of the rolls R R' is shown as contacting with one of the sheets at a place which is not opposite the joint as well as at the place opposite the joint. Is that so?

A. Yes, the area of contact is shown as being greater than the area of the joint in Fig. 1. This would substantially reduce extrusion.

X-Q. 224. Is that portion of each sheet, which is in contact with the roll and not opposite the place to be welded, heated by the passage of the current?

A. The current would be principally concentrated in the path corresponding to the width of the joint and in this path the principal heating effect will be secured. There will, however, be a slight diffusion of the current in the plates at each side of the joint and this will produce a heating effect proportional to the current flow.

X-Q. 225. You have referred to seeing spot welding carried out at the works of the defendant, the Ford Motor Co. When was this?

A. In March, 1918.

X-Q. 226. Did you see the welding of any other parts than the mufflers?

A. I did.

X-Q. 227. What parts?

A. Spot welding machines were used for the purpose of upsetting the ends of valve stems for the valves of Ford motors, the stem and valve first being pre-heated in a muffle and the upper electrode brought down upon the end of the valve stem projecting a short distance beyond the valve so as to heat that valve stem by concentration of the current therein, thus softening the metal and forcing it down upon the valve. This operation is similar to riveting and illustrated one of the uses to which spot welding machines can be applied. Other spot welders were used for performing the same operation in upsetting the projecting end of a contact plate used in the Ford distributor, this being also analagous to a riveting operation. Other spot welders were used for welding a metal sheath to the steering post of the Ford car, and in this operation only a single electrode was used. The post itself constituted practically

the other electrode. Other spot welders were used for tightening two small metal pieces together which had previously been riveted in the ordinary way. Other spot welders were used for securing a long strip to the fender of the car. I have photographed all of these operations, which I will be glad to show you, if counsel for defendant consents. Other spot welders were used in forming the radiators, and still others in connection with body making. Also spot welders were used in manufacturing the connection between the carbureter and the engine which I have photographed.

X-Q. 228. You have shown me some photographs. Did you have any other photographs taken of the spot welding work or apparatus at the defendant's plant?

A. Only those photographs showing the manufacture of mufflers, which I produced at Washington.

X-Q. 229. Have you any photographs of your experimental work with spot welders in addition to what you have already shown me?

A. Yes.

X-Q. 230. Are you willing that I should see those photographs?

A. Yes, sir.

X-Q. 231. Are you paid as an expert in this case by the defendant or by some other person or persons?

A. By the Ford Motor Co.

*Redirect Examination* by MR. CHURCH.

By MR. CHURCH:

Re-D. Q. 232. You have produced a series of photographs in response to questions put by the cross-examiner illustrating work done by spot welders at the defendant's plant and apparatus by which such work was done. Will you please briefly describe these photographs and mark them with some designation by which they may be identified.

A. Photograph marked B<sup>1</sup> shows the two sections of the fender prior to welding, and photograph marked B<sup>2</sup> shows corresponding sections welded together. Photograph B<sup>3</sup> shows a valve for the Ford engine, the view at the right illustrating the valve stem before it has been upset and the view at the left showing the valve stem after upsetting. Photograph B<sup>4</sup> shows the spot welder used for upsetting the valve stems, the lower electrode being provided with a vertical hole therein through which the valve stem passes, and this lower electrode being slidable outwardly from its operative position by means of a handle so as to permit the valve stem to be placed in position. Photograph B<sup>5</sup> shows the lower electrode pulled out with the valve stem and valve in position. And photograph B<sup>6</sup> shows the parts in position to effect the welds or upset, the upper electrode being brought down into contact with the valve stem above the valve.

Photograph B<sup>7</sup> shows a small contact plate used in the Ford

distributor, the view at the left showing the parts before upsetting, and the view at the right showing the parts after upsetting. The welder used for performing this upsetting operation is illustrated in photographs B<sup>7x</sup>, B<sup>8</sup>, B<sup>9</sup>. With this machine the lower electrode is provided with a vertical hole which receives the stem of the contact member. Photograph B<sup>7x</sup> shows the machine, or rather the arms or horns thereof, without the work in place. Photograph B<sup>8</sup> shows the same thing with the work in place, and photograph B<sup>9</sup> shows the upper electrode brought down on the stem to upset the same.

Photograph B<sup>10</sup> shows a small lever which, as I recall, is used in the ignition system, composed of two parts riveted together in the usual way. The rivet head being shown in both views. The view at the right shows these parts before electric welding has been performed, and the view at the left shows the parts after electric welding. I call particular attention to this latter view which very clearly shows that although the weld has been formed within the edge of the work the metal has been extruded through the joint between the work and appears as a small fin of projecting metal.

Photograph B<sup>11</sup> shows a so-called hot air pipe, many of which I saw welded, the upper view illustrating one section of the pipe, the middle view showing the other section of the pipe, and the bottom view showing the two sections welded together. Both of these welds clearly illustrates extrusion of metal.

Photographs B<sup>12</sup>, B<sup>13</sup> and B<sup>14</sup> illustrate the welding used for welding to the steering post the metal sheath through which pass the wires or wire controlling the throttle or timing operations, as the case may be. The first of these photographs B<sup>12</sup> shows the welding machine without the work, the lower arm of the welder being provided with a saddle in which the steering post rests, this steering post being tubular. Photograph B<sup>13</sup> shows the work assembled, the upper electrode having just performed a welding operation, and photograph B<sup>14</sup> showing the upper electrode performing this operation.

Re-D. Q. 233. Will you in like manner identify and mark the photographs which you have referred to as illustrating your experiments

A. Photograph marked C<sup>1</sup> is a picture of my assistant, Mr. Perkins, and myself making a line weld between two plates.

Photographs C<sup>2</sup>, C<sup>3</sup> and C<sup>4</sup> illustrate various roller electrodes with which I operated at Detroit.

Photographs C<sup>5</sup> and C<sup>6</sup> illustrate the use of a roller electrode, the periphery of which is formed with a series of teeth like a gear wheel so as to produce a series of isolated or separate welds, each surrounded by an area of non-welding.

Photograph C<sup>7</sup> illustrates various electrodes with which I made experiments at Detroit. In this photograph the electrode at the left on the top line and also at the right are carbon electrodes. The photographer has not assembled these in pairs; the pointed



electrodes should go together and so also should the blunt electrodes. The electrodes at the center of the top line are copper electrodes with hollowed outfaces suitable for riveting or for making annular welds. In the center line, the electrodes at the left are copper electrodes, those in the middle are steel electrodes, and those at the right are copper electrodes with Tungsten points. In the bottom line the electrodes at the left are copper electrodes made long and pencil-like, the next are flat or disc-like electrodes, the next are ordinary standard spot welding electrodes of copper and the electrodes at the right are each provided with two contact faces to make two welds simultaneously.

The final photograph marked C<sup>8</sup> is an apparatus which I built to make two spot welds concurrently with a riveting operation, the riveting being performed by means of hollowed or concave electrodes screwed in place in the usual way.

Re-D. Q. 234. Please state whether or not the apparatus and electrodes illustrated in this series of photographs C<sup>1</sup> to C<sup>8</sup> inclusive were successfully used and the result of their use?

A. They were. With all of them I obtained the welds between metal sheets corresponding to the form or shape of the electrodes.

Re-D. Q. 235. Would you be willing to repeat the tests made with the apparatus and electrodes shown in this last-mentioned series of photographs for the benefit of the plaintiff's counsel?

A. I will cheerfully do so.

Re-D. Q. 236. State whether or not since making these tests you have been able to test the use of electrodes of iridium for producing spot welds, and if so, with what result?

A. Yes, I have done so with entirely successful results.

Re-D. Q. 237. The Harmatta patent says, page 1, line 57: "By the term 'electric welding' as used herein, I mean that well-known process in which the work is brought to the welding temperature by internal heat generated by the resistance of the work itself to the passage of an electric current at the place of contact between the parts to be joined by the welding pressure." Do you find any warrant for this statement in the Harmatta original application?

A. I do not.

Re-D. Q. 239. In the Harmatta patent, page 2, line 83, I find this statement, "Sheet metal work made by this process is readily distinguished from that made by prior processes by the comparative absence of burning, roughening or disintegration of the material on the back of the plate when the operation is carefully conducted. It further possesses the advantage that there are no rivet heads to mar the finish of the back or outer surfaces of the plate." State whether or not you find any warrant for this statement in the original application of Harmatta.

A. Not the slightest.

Re-D. Q. 239. State whether or not according to your observation or experience spot welding is used in preference to ordinary riveting where a strong and reliable joint or union is required.



A. It is not. The character of the weld is too uncertain.

Re-D. Q. 240. In the use of an ordinary spot welding machine—a standard machine—what would be the effect of holding the work too long between the electrodes of the machine?

A. There would be danger of burning through the plates so as to make a hole.

Re-D. Q. 241. When, as you have stated, you used iridium as electrodes for spot welding what was the nature of the plates upon which you operated? Give their material and thickness.

A. Cold rolled steel plates about .020 inch in thickness.

(Mr. Church: Counsel for defendant requests counsel for plaintiff to admit without formal proof that the several patents to Thomson and to Lemp and to Rietzel are owned by the plaintiff or its predecessor, Thomson Electric Welding Co.)

(By Mr. Stackpole: Counsel for plaintiff will stipulate as to these facts when he ascertains what the facts are.)

Re-D. Q. 242. Does the photograph B<sup>2</sup> show two spot weld in the upper right-hand corner of the fender uniting the fender to the long strip shown?

A. Yes, sir.

Deposition closed—signature and certificate waived.

Adjourned until further notice.

THOMSON SPOT WELDER COMPANY

vs.

FORD MOTOR COMPANY.

Met pursuant to agreement of counsel at the offices of Fish, Richardson & Neave, 84 State Street, Boston, Mass., 3 P. M., October 3, 1918.

Evidence for the defendant taken under Equity Rules of the Supreme Court of the United States by agreement of counsel.

J. L. STACKPOLE, Esq., counsel for plaintiff.

MELVILLE CHURCH, Esq., counsel for defendant.

*Direct Examination* of CHARLES F. TISCHNER.

Question 1. Please state your name, age, residence and occupation.

Answer. Name, Charles F. Tischner; age, 38; residence, New York City; occupation, patent attorney.

Q. 2. With what firm are you associated, if any?

A. The firm of Townsend & Decker.

Q. 3. How long have you been associated with that firm?

A. I have been associated with that firm for approximately 15 or 16 years.

Q. 4. In what capacity?

A. Preparing specifications and conducting cases for the Patent Office.

Q. 5. I hold in my hand what purports to be a certified copy from the records of the Patent Office of the file wrapper and contents in the matter of the Letters Patent of Adolph F. Rietzel, assignor to Thomson Electric Welding Company, No. 928,701, granted July 20, 1909, for improvement in uniting the component parts of composite sheet metal structures. From a copy of the drawing of the patent which appears in this file and from other papers in the file, it appears that the solicitors who solicited this Rietzel patent were Messrs. Townsend & Decker, and it also appears that C. F. Tischner, Jr., appears as a witness in that drawing. Were you associated with Messrs. Townsend & Decker during the prosecution of the application of this patent, and is that your name signed as a witness on the drawings?

A. I was, and it is my name. At that time I used the word "Jr." after my name, but since then I have dropped it owing to the death of my father.

Q. 6. State whether or not you took part, as the representative of Messrs. Townsend & Decker, in the prosecution of this Rietzel application?

A. I took part in a general way.

Q. 7. What do you mean by having taken part in a general way?

A. I did not have direct conduct of the case.

Q. 8. It appears from this file wrapper that an affidavit was executed by the applicant Adolph F. Rietzel bearing date October 23, 1908, and filed in the Patent Office on November 30, 1908. Do you recall the circumstances connected with making and filing that affidavit?

A. I do not recall much of the circumstances at this time, but presume I knew them at the date of the affidavit as it was subscribed before me as notary public.

Q. 9. Who prepared that affidavit?

A. I believe the affidavit was prepared by Mr. Henry C. Townsend, the senior member of Townsend & Decker.

Q. 10. What makes you think that Mr. Townsend prepared it?

A. For the reason that Mr. Townsend had direct charge of the case at that time.

Q. 11. Where was that affidavit executed?

A. The affidavit was executed in New York City.

Q. 12. Was Mr. Adolph Rietzel present before you when it was subscribed and sworn to by him?

A. To the best of my knowledge he was.

Q. 13. State if you know from whom the data incorporated in this affidavit was procured?

A. The data I do not recall.

Q. 14. The affidavit in full reads as follows:

"MAIL ROOM

NOV 30 1908

U. S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE.

Hon. Commissioner of Patents,  
Washington, D. C.

Sir:—

In the matter of the application of ADOLPH R. RIETZEL,  
filed Feb. 24th, 1905, S. N. 247,081 for Uniting Sheet Metal  
By Electric Welding.

AFFIDAVIT.

County of New York }  
State of New York } ss

ADOLPH F. RIETZEL, being duly sworn deposes and says that he is the applicant who filed the above entitled application for patent; that some time in June 1904 he successfully practised the invention in said application by uniting two halves of a sheet metal pulley in an electric welding machine at the shop of the Thomson Electric Welding Co., in Lynn, Mass.; that the piece of sheet metal herewith attached and marked: "specimen of pulley C. F. Tischner Jr., N.P." is a duplicate of one of the halves of the pulley to which he at that time applied the invention; that the contact points or projections formed in the sheet metal were in the first instance made by filing the metal to leave the contact points or projections, indenting not being available at that time, but that in subsequent operations in which his invention was employed the projections were made by indenting the sheet metal, and that the invention was frequently practised by him successfully at the shop of said Company on a standard welding machine; that in conducting the operations on such machines he employed a pair of contacts fitted in the jaws of the machine and formed at their outer ends so as to fit into the cup shaped portion of the halves of the sheet metal pulley to be welded, thereby supporting the two halves with the contact projections engaged with one another; the two halves being in contact by the projections while assembled in the machine, electric current was caused to pass through the two halves by the contact projections, and pressure was then applied in the usual way practised in electric welding by the standard machine in which the operation in question was conducted; the operations above recited as conducted by him were uniformly successful and demonstrated clearly that the invention was complete in

all particulars, and that the said invention has been since practised on innumerable occasions in substantially the same way for uniting pieces of sheet metal such as the halves of sheet metal pulleys of the form shown in the exhibit and of other forms and of other sizes, many of much larger size than that of the exhibit; that he does not know and does not believe that the invention aforesaid has been in public use or on sale in this country, patented or described in a printed publication in this or any foreign country for more than two years prior to his application and that he has never abandoned the invention.

ADOLPH F. RIETZEL.

Subscribed and sworn to by the aforesaid Adolph F. Rietzel before me this 23d day of October 1908.

C. G. TISCHNER JR  
Notary Public.

(Seal) NOTARY PUBLIC, KINGS COUNTY.  
CERTIFICATE FILED IN NEW YORK COUNTY."

Do you recall having seen the exhibit marked, according to the affidavit, "Specimen of Pulley, C. F. Tischner, Jr., N.P."?

(Objection is taken by Mr. Stackpole once and for all to all testimony concerning this affidavit as being irrelevant and immaterial.)

A. I cannot say that I do recall having seen it at this time.

Q. 15. Were you at this time identified with the prosecution of the Rietzel application aforesaid,—that is to say, did you have anything to do with its prosecution at that time?

A. As I now recall, I only had more or less of a superficial knowledge of the case at that time.

Q. 16. Do you know whether or not the specimen of pulley referred to was filed, as a matter of fact, in the Patent Office with the affidavit?

A. I cannot say of my own knowledge at this time that it was filed.

Q. 17. Did you ever see it on file in the Patent Office?

A. I did not.

Q. 18. Do you know what became of it?

A. I do not.

Q. 19. Is it not now in the custody of Messrs. Townsend & Decker?

A. Insofar as I know, it is not.

Q. 20. What has become of it?

A. I do not know.

Q. 21. I find in this file another affidavit of Adolph F. Rietzel reading as follows:

"MAIL ROOM

Mar 13 1909

U. S. PATENT OFFICE

U. S. PATENT OFFICE

MAR 15 1909

DIVISION 26

## IN THE UNITED STATES PATENT OFFICE.

In the matter of the application for patent of Adolph F. Rietzel, S. N. 247,081, filed February 24th, 1905, for Electric Welding:

## AFFIDAVIT.

County of New York }  
State of New York } ss:

ADOLPH F. RIETZEL, being duly sworn, deposes and says, that he is the applicant that filed the above entitled application for patent;

That prior to the 18th day of February, 1904, he repeatedly, successfully practised the method of fastening two sheets of metal together face to face by welding them at spots in their meeting surfaces by confining the heating electric current passed from one plate to the other in such spots and localizing the welding pressure at said spots, as claimed broadly in said application;

That the work of so uniting such sheets of metal was done at the factory of the Thomson Electric Welding Company at Lynn, Massachusetts, on a Welding Machine of a commercial type known as type 10 A Welder;

That said machine was the same in construction as the machine known as type 5 A Welder but of larger size and was identical with that shown on the attached page removed from a catalogue of the Thomson Electric Welding Company, which page is identified and marked "Page of Catalogue, D. M. Edsall, N. P.";

That the accompanying pieces of work marked "Specimen No. 1, D. M. Edsall, N. P." and "Specimen No. 2, D. M. Edsall, N. P." are duplicates of work so done by him on that machine prior to the 18th day of February, 1904, but that the original specimens were not preserved;

That in doing such work he employed a pointed electrode, the same in form as the accompanying electrode marked for identification "Welding Electrode, D. M. Edsall, N. P.", which electrode was clamped in one of the holders of the machine and was used to apply the localized pressure and heating current to the plates which were welded together at spots in their superficial area, the opposite or backing electrode being a block of metal which was flat and of a superficial area, approximating the area of the plates which were welded together and which opposite electrode was clamped in the opposite holder of the machine;

That in this operation the two plates superposed upon one another were inserted between said electrodes and the pressure

and heating current localized as claimed were applied by forcing the pointed electrode against the outside face of the plates and pressing them between said pointed electrode and the opposite flat electrode, current being at the same time passed from one electrode to the other and pressure being applied by employing the usual devices forming a part of the machine and used in the ordinary operation of the machine for applying welding pressure to the work.

That work was repeatedly and successfully done in this manner upon various sizes and pieces of metal plates, none of which however, are now in existence so far as affiant has been able to discover;

That the work done by him as aforesaid, demonstrated the complete success of the operation and that metal plates could be successfully and firmly united together by distinct or isolated electric welds forming welded spots of union in their meeting faces and constituting in effect a successful substitute for a union of the same by a number of rivets.

ADOLPH F. RIETZEL

Subscribed and sworn to before me this 18th day of February, 1909.

DAVID M. EDSALL  
Notary Public  
N. Y. Co."

(Seal)

Do you recall the preparation and filing of this affidavit of Mr. Rietzel of February 18, 1909?

(Same objection is made by Mr. Stackpole with reference to this affidavit.)

A. I cannot now say that I recall the preparation of this affidavit.

Q. 22. State if you know who prepared it.

A. It is my impression that Mr. Townsend prepared it.

Q. 23. Are you sure that you did not prepare it?

A. I am positive that I did not prepare it.

Q. 24. Do you know independently of the record that such an affidavit was prepared and filed?

A. I do not.

Q. 25. Do you know what has become of the various exhibits referred to in this affidavit?

A. I do not.

Q. 26. Do you know whether or not they were in fact filed in the Patent Office?

A. Of my own knowledge I cannot say.

Q. 27. Do you recall having seen the page of catalogue that was annexed to the affidavit, a copy of which I now show you?

A. The cut in the catalogue is a familiar illustration to me, but whether I saw it at the time of its being annexed to the affidavit I cannot now say.

Q. 28. Do you recall the fact of the presence of Mr. Rietzel in New York at the time this affidavit was prepared?

A. I do not.

Q. 29. Is Mr. Henry C. Townsend, whom you think prepared both of these affidavits, now living, and if so, where is he?

A. He is now living and, to the best of my knowledge, is at 149 Broadway, New York City.

Signature waived.

No cross-examination.

Certificate waived.

IN THE DISTRICT COURT OF THE UNITED STATES

FOR THE

EASTERN DISTRICT OF MICHIGAN,

SOUTHERN DIVISION.

IN EQUITY

HARMATTA PATENT NO. 1,046,066.

THOMSON SPOT WELDER COMPANY, PLAINTIFF,

*vs.*

FORD MOTOR COMPANY, DEFENDANT.

Deposition of Henry C. Townsend, taken pursuant to notice and by consent in behalf of the Defendant at the office of Townsend & Decker, 149 Broadway, New York City, on the 30th day of October, 1918, before Mr. George E. Brown, Notary Public in and for the State of New York.

Present: J. L. STACKPOLE, ESQ., in behalf of Plaintiff.

MELVILLE CHURCH, ESQ., in behalf of the Defendant.

HENRY C. TOWNSEND.

HENRY C. TOWNSEND, being duly sworn, deposes and says in answer to interrogatories propounded to him by Mr. Church as follows:

Question 1. Please state your name, age and residence.

Answer. Henry C. Townsend; age 68; present residence Montclair, New Jersey.

Q. 2. You were at one time an Examiner in the Patent Office in charge of the class of electricity, were you not?

A. Yes.

Q. 3. When did you resign from the Patent Office?

A. In the Fall of 1880.

Q. 4. Since that time you have been engaged in the preparation and prosecution of applications before the Patent Office and specifically in the preparation and prosecution of applications for the Thomson Electric Welding Company, have you not?

A. Very largely until within more recent years when many of the applications have been prepared by my partner, Mr. Tischner.

Q. 5. You prepared the original applications of Elihu Thomson which resulted in patents Nos. 347,140 and 347,141, dated August 10th, 1886, covering the fundamentals of the art of electric welding, did you not?

A. Do you mean the specification and claims? They were, as to the specifications largely description furnished by Prof. Thomson, and as to the claims, I do not recall. I think I drew them, however; some of them.

Q. 6. You appeared as solicitor of record in those original Thomson cases, did you not?

A. Yes.

Q. 7. And they were assigned, were they not, to the Thomson Electric Welding Company?

A. That's all a matter of record. I don't know.

Q. 8. The work that you did for Professor Thomson in the way of preparing and prosecuting applications for patents on electric welding was paid for by the Thomson Electric Welding Company,

A. It was paid for personally by Prof. Thomson as I recall, but just what Company or what the title of the Company was or who the individual was that paid for the work I could not say positively without consulting records.

Q. 9. You have prepared and prosecuted applications for patents relating to electric welding for others than Elihu Thomson for the Thomson Electric Welding Company, have you not?

A. Yes.

Q. 10. I draw your attention to patent No. 928,701, granted July 20th, 1909, upon an application filed February 24th, 1905, for Uniting the Component Parts of Composite Sheet Metal Structures, and ask you whether or not you prepared and prosecuted the application for that patent?

A. I did most if not all the work on that case.

Q. 11. I notice that the sheet of drawings forming a part of this patent is signed thus: "Inventor Adolph F. Rietzel, by Townsend & Decker Attorneys." Were you a member of the firm of Townsend & Decker at that time?

A. The senior member.



Q. 12. Can you tell me when that firm was organized, approximately?

A. I cannot. It was many years prior to the filing of the application for Rietzel.

Q. 13. This Rietzel patent on its face appears to have been issued to the Thomson Electric Welding Company as assignee of Rietzel. Does it accord with your recollection that the application for this patent was assigned to the Thomson Electric Welding Company before the patent issued?

A. I have no recollection about those matters in detail.

Q. 14. Did the Thomson Electric Welding Company pay you for your services in the preparation and prosecution of this Rietzel application?

A. Yes.

Q. 15. I have before me a certified copy of the file wrapper and contents in the matter of the Rietzel patent No. 928,701 to which I have previously referred and from the disclosure of the application as originally presented I find that the only method or process specifically described and claimed consisted in the welding of sheets or plates of metal together at their plane surfaces by providing a multiplicity of contact points or spots between said surfaces, passing a heating electric current from one plate to the other through said points in multiple and applying pressure in a direction to form a number of points of welded union between said plates and sheets. Am I right about this?

A. That seems to be the case.

Q. 16. I also find that after a series of rejections on the part of the Patent Office followed, in turn, by a series of amendments on your part, a citation was made by the Patent Office Examiner in a communication of June 8th, 1908, of the British patent to Harmatta No. 22,981 of 1903, after which a new specification and claims were filed to wit: On November 30th, 1908, which considerably broadened the scope of the application so that it was made to cover, as for instance by claim 2 following:

"2. The herein described method of uniting two pieces of metal at a number of distinct or separate spots separated from one another by well defined areas of no union, consisting in applying pressure localized at the spots of desired union, and passing electric current through the pieces from one to the other while confining the flow of current to said spots until the union is effected."

Do you recall the broadening of the application and claims thereof in view of this citation of the English patent to Harmatta?

A. I do not recall just how the broadening of the application came about. I generally study my cases while they are before the Patent Office and if it at any time occurs to me that the original claims are insufficient to protect the inventor in what he appears to have contributed to the art I endeavor to broaden the claims.

Q. 17. Well, you do recall the fact that this Rietzel application was broadened as to its claims?

A. Oh, yes.

Q. 18. I further find that when this broadened specification and these broadened claims were filed, and affidavit of Mr. Rietzel, verified October 23rd, 1908, was also filed and that in that affidavit Mr. Rietzel swore that he had successfully practiced the invention of his application some time in June, 1904, which date I understand was prior to the effective date of the Harmatta British patent which, though on its face dated in 1903, was not in fact issued as a patent until sometime in 1904. Do you recall these facts?

A. I recall the fact that an affidavit or affidavits were prepared for the purpose of overcoming the dates of the patent or patents set up against the Rietzel application and the Harmatta patent is the only one that I now recall as having required affidavit of priority such as required by the Patent Office or a rule thereof.

Q. 19. The rule of the Patent Office to which you refer is known as Rule 75, is it not, which reads as follows:

"75. When an original or reissue application is rejected on references to an expired or unexpired domestic patent which substantially shows or describes but does not claim the rejected invention, or on reference to a foreign patent or to a printed publication, and the applicant shall make oath to facts showing a completion of the invention in this country before the filing of the application on which the domestic patent issued, or before the date of the foreign patent, or before the date of the printed publication, and shall also make oath that he does not know and does not believe, that the invention has been in public use or on sale in this country, or patented or described in a printed publication in this or any foreign country for more than two years prior to his application, and that he has never abandoned the invention, then the patent or publication cited will not bar the grant of a patent to the applicant, unless the date of such patent or printed publication is more than two years prior to the date on which application was filed in this country."

A. Just how the rule read at that time I don't recall. There was some rule of the same general import at the time but, as I understand, the rule has been frequently changed.

Q. 20. The rule that was involved at that time was to the same purport, was it not, as the one I have quoted?

A. I would infer that from the fact that an affidavit such as you refer to was filed.

Q. 21. It was customary, was it not, at that time, when filing an affidavit for the purpose of showing completion of the applicant's invention before the effective date of the patent cited against him, to not set up the exact date of applicant's completion of the invention but only a date that was prior to the date of the patent desired

to be anticipated? In other words, the applicant did not give away in his affidavit anything more than he was required to satisfy the rule? Am I not right about this?

A. It was very common practice to so confine the affidavit as to date but I have known instances where inventors have shown their whole hand and gone further than the rule required. I presume that in this case the affidavit covered as to date what has been my usual practice to allege,—the date prior to the legal date of the reference as an anticipation.

Q. 22. Please examine this affidavit of Rietzel's verified October 23rd, 1908, and state whether you prepared it?

A. I have no means of telling. If I do not personally prepare it I directed that it be prepared and embody the facts as furnished by the inventor.

Q. 23. Who did furnish the facts embodied in this affidavit?

A. I presume the inventor or the Company. I don't recall from whom the facts came directly.

Q. 24. Would you give us the impression that you do not recollect anything about the preparation of this affidavit?

A. I only remember that an affidavit of that character was filed and prepared on information furnished on behalf of the inventor or the Company. Whether I personally dictated or drafted that affidavit I cannot say because I do not recall having personally done so. If I did not draw it I supervised the drawing of it and approved it.

Q. 25. And before filing the affidavit you were satisfied with the facts alleged therein from the evidence brought to your attention?

A. I drew the affidavit or had it drawn to embody the facts furnished by the inventor and I left it to the Patent Office to decide whether it was sufficient to accomplish the purpose of overcoming the reference.

Q. 26. Did you go to Lynn and confer with Mr. Rietzel and examine such evidence as he had substantiating the statements of this affidavit before approving the affidavit?

A. Not that I recall. My first impulse when you started the question was to say no, that I did not.

Q. 27. Did you ever meet Mr. Rietzel?

A. Oh, yes.

Q. 28. Where?

A. In this office and sometimes in Lynn.

Q. 29. In those days you not infrequently went to Lynn, is that not a fact?

A. I should say infrequently.

Q. 30. You had a good deal of work for the Thomson Electric Welding Company at that time, had you not?

A. Yes, but I sought to put much of the disagreeable labor and burden on others.

Q. 31. You recall having met Mr. Rietzel at your office in New York?

A. Yes.

Q. 32. Do you not think it probable that he was in New York

when this affidavit of October 23rd, 1908, was prepared and brought with him the specimens that are referred to in the affidavit?

A. He must have brought or sent the specimens but whether he was here when the affidavit was prepared I do not recall.

Q. 33. At all events, you satisfied yourself that the facts were as represented in this affidavit before you filed the affidavit? Am I not right about this?

A. I took the inventor's statement on the subject. I did not make any investigation of any records or archives of the inventor or his Company.

Q. 34. Did you confer at all with anyone else than Rietzel about the subject of this affidavit? If so, with whom?

A. You mean with reference to the facts set forth?

Q. 35. Yes.

A. No, not that I recall. I may have talked the thing over with someone in my office but not with anybody representing the Company or the inventor apart from myself or my assistant.

Q. 36. This affidavit of October 23rd, 1908, refers to the union "of two halves of a sheet metal pulley in an electric welding machine at the shop of the Thomson Electric Welding Company in Lynn, Mass., and to "the piece of sheet metal herewith attached and marked 'Specimen of Pulley, C. F. Tischner, Jr., N. P.' as" a duplicate of one of the halves of the pulley to which he at that time applied the invention". Do you recall the specimen here referred to?

A. I recall there having been a specimen in this office of a pulley of that character and I think that the specimen must have been filed in connection with that affidavit. It is difficult to recall these matters of detail after this whole lapse of time. My best recollection is that such a specimen was used.

Q. 37. Will you please describe that specimen according to your best recollection of it. Tell us what it showed?

A. About all I recall of that specimen is that it was a small pulley made up of two halves of sheet metal secured together at intervals at the hub or near the center but you should understand that the pulley and the only pulley I am able to visualize now, may or may not have been the pulley used as an exhibit because from time to time we have had different specimens of that character about my office. As to that particular exhibit, while I am satisfied that one was filed and that it in some way answered to the statements in the affidavit, my recollection as to the exact construction is rather hazy.

Q. 38. You have no doubt, have you, that the affidavit correctly described the specimen that was annexed to it?

A. No.

Q. 39. Where is that specimen?

A. I do not know.

Q. 40. Did you ever withdraw it or cause it to be withdrawn from the Patent Office?

A. I don't recall having done anything about withdrawing that exhibit.

Q. 41. And so far as you know it is now in the Patent Office on file?

A. Yes.

Q. 42. On December 14th, 1908, the record shows, two French patents of Egel Nos. 336,187 and 335,889 were cited to the broad claims of Rietzel. The first of these Egel patents to wit: No. 336,187 was dated October 13th, 1903, published as of the 1st day of March, 1904, and granted as of the 7th day of January, 1904, was it not?

A. The record will show.

Q. 43. And the disclosure of this Egel patent 336,187 is identical with the disclosure of the Harmatta British patent, is it not?

A. I don't know.

Q. 44. Did you never investigate this?

A. I may have but I don't see any reason why I should compare these two patents for the purpose of ascertaining whether they were identical or not. All I can say is that I do not recall about that.

Q. 45. At all events, the citation of this Egel French patent 336,187 called for and required another antedating oath from Rietzel, did it not, in order that the date of the completion of his invention might be carried back of the date of the Egel French patent so as to enable Rietzel's patent to be granted?

A. As I recall, it was necessary to overcome the date of the Egel French patent and that we had to do that by an affidavit.

Q. 46. In the "REMARKS" annexed to a letter that you wrote to the Patent Office under date of March 3rd, 1909, which was received and filed in the Patent Office March 13th, 1909, you state "We file herewith an affidavit establishing completion of the invention on applicant's part prior to the dates of the French patents cited by the Examiner in his last official letter." Does this refresh your recollection as to the reason for filing this additional Rietzel affidavit on February 18th, 1909?

A. No, I remember it independently of any quotation you may make from a letter you may find in the record.

Q. 47. Now referring to this affidavit of Mr. Rietzel of February 18th, 1909, I note that it says:

"that prior to the 18th day of February, 1904, he repeatedly successfully practiced the method of fastening two pieces of metal together face to face by welding them at spots in their meeting surfaces by confining the heating electric current passed from one plate to the other in said spots and localizing the welding prepared at said spots, as claimed broadly in said application."

Further on in the affidavit I find this description:

"that in doing such work he employed a pointed electrode, the same in form as the accompanying electrode marked for identification 'Welding Electrode, D.M. Edsall, N.P.,' which elec-

trode was clamped in one of the holders of the machine and was used to apply the localized pressure and heating current to plates which were welded together in their superficial area, approximating the area of the plates which were welded together and which opposite electrode was clamped in the opposite holder of the machine; that in this operation the two plates superposed upon one another were inserted between said electrodes and the pressure and heating current localized as claimed were applied by forcing the pointed electrode against the outside face of the plates and pressing them between said pointed electrode and the opposite flat electrode, current being at the same time passed from one electrode to the other and pressure being applied by employing the usual devices forming a part of the machine and used in the ordinary operation of the machine for applying welding pressure to the work; that work was repeatedly successfully done in this manner upon various sizes and pieces of metal plates, none of which however, are now in existence so far as affiant has been able to discover; that the work done by him as aforesaid, demonstrated the complete success of the operation and that metal plates could be successfully and firmly united together by distinct or isolated electric welds forming spots of union in their meeting faces and constituting in effect a successful substitute for a union of the same by a number of rivets."

This description contained in the affidavit, of what was done by Mr. Rietzel prior to the 18th day of February, 1904, is and was intended to be a description of what we now know as spot welding, is it not?

A. It was intended to be a description which would establish the fact that the inventor had, prior to a certain date, practiced some process upon which the claim rejected would be founded. If the process claimed was spot welding I suppose the description of the affidavit could be said to describe spot welding.

Q. 48. You prepared this affidavit of February 18th, 1909, did you not?

A. Parts of it sound like my dictation.

Q. 49. Have you any doubt that you prepared it?

A. I am not sure that I did. My doubt would be as to whether I did or not. I couldn't say that I have no doubt. I could say from the fact I mention that I probably did, or at any rate, parts of it.

Q. 50. The affidavit at least met with your approval and was not filed until approved by you. That's correct, isn't it?

A. Yes.

Q. 51. And was intended to set forth a reduction to practice by Rietzel of a process of electric welding of sheets or plates of metal that did not have projections upon them?

A. I don't recall that. I should say that there was no intention to describe the process as one in which projections were excluded from the practice of the process as related in the affidavit. The intent was simply to furnish an affidavit to the Patent Office that would satisfy

the Examiner under the rule and procure the allowance of the application.

Q. 52. Will you please take this affidavit of February 18th, 1909, and read it carefully from beginning to end and state if you find therein any description of the welding together of plates that were provided with projections at the points of welding.

A. I find no statement on the subject.

Q. 53. You are familiar, are you not, with modern spot welding, so-called?

A. So far as disclosed in patents I might be said to be reasonably familiar with it.

Q. 54. Have you never seen spot welding practiced?

A. I don't recall any instance at present.

Q. 55. Will you please state how you understand the modern process of spot welding to be practiced where employed for the union of thin plates or sheets of metal?

A. The best description of that process would be for me to take the Harmatta specification and quote from it.

Q. 56. I would prefer your own language. Please give me a short description of the process of electrically uniting thin plates or sheets by the so-called spot welding process.

(By Mr. Stackpole: Objected to as irrelevant and incompetent.)

A. I am not a welding expert so far as actual practice goes and I am not an expert in any sense excepting in the very limited sense that I have related. I don't care to spend my time in endeavoring to formulate what I would consider a just and exact statement of what spot welding is or just how you would proceed to satisfy the definition of spot welding.

Q. 57. Did you prepare or have any part in preparing the ultimate specification and claims of the Harmatta patent 1,046,066 as they appear in the patent issued?

A. Yes.

Q. 58. Did you prepare the ultimate specification and claims?

A. Yes.

Q. 59. I now show you a copy of the Harmatta patent which is the patent here in suit and ask you to select and quote upon the record any claim therein that you think is fairly descriptive of what is known as spot welding to-day.

A. I do not think I should be called upon to select a claim of this patent which would be suitable for the owners thereof to use as a claim against an infringer in the spot welding art, nor do I think I should be called upon to express a view on this subject under any circumstances unless based upon some material exhibit or some particular procedure as practiced and witnessed by me, or as described by someone who has seen the infringing process performed. I am not on the stand here to act as a so-called patent expert or as



a spot welding expert and I object to my time being taken up by questions of this nature.

Q. 60. Coming back to the affidavit of Rietzel dated February 18th, 1909, was it not your intention in drawing that affidavit to show that Rietzel had, prior to the date of French patent to Egel, to wit French patent No. 336,187, reduced to practice the process of electric welding disclosed in said Egel patent?

A. I should say, without endeavoring to put my mind now back into the frame in which it might have been at that particular time or on that particular occasion, that the intent was to show that Mr. Rietzel had practiced the invention of the claim or claims rejected on Egel prior to the legal date of Egel. The Examiner seemed to think that Egel anticipated and, as I recall, was very strongly of that opinion, and without endeavoring to disabuse him on that idea, the easiest way or the natural way under many cases and in this case perhaps, was to simply file an affidavit as to the fact and so dispose of the whole matter.

Q. 61. This affidavit of February 18th, 1909, refers to a specimen of work, annexed to and furnished with it, in the following language:

"that the accompanying pieces of work marked 'Specimen No. 1, D. M. Edsall, N.P.' 'Specimen No. 2, D. M. Edsall, N.P.' are duplicates of work so done by him on that machine prior to the 18th day of February, 1904, but that the original specimens were not preserved".

Do you recall those specimens of work?

A. I think I do.

Q. 62. What did they show? Describe them?

A. They showed two plates of metal, I should think about two inches long on the side, one of them at least, which is the only one which I clearly recollect, and that is the one about which I am making the statement, and those two plates were apparently fastened together and by what was said to be a weld on their opposing surfaces. They may have been in thickness some fraction of an inch, I should say less than a quarter, but just what the measurement of thickness would be expressed in fractions of an inch, I could not say as I am unaccustomed to measuring things by the eye in fractions of lineal measure.

Q. 63. Were those specimens filed in the Patent Office with the affidavit?

A. I suppose they were. It was my intention to have them filed.

Q. 64. Do you know where they are now?

A. I do not.

Q. 65. Did you withdraw them or cause them to be withdrawn from the Patent Office?

A. Not that I recall.

Q. 66. Have you ever made a search for them at the Patent Office to see whether they are there?



A. No.

Q. 67. Has any one to your knowledge made a search for them to that purpose?

A. I think Mr. Tischner stated that he had made a search.

Q. 68. With what result?

A. The only statement that I recall on the subject is that they were not there.

Q. 69. Mr. Tischner is your present partner?

A. Yes.

Q. 70. And his full name is Mr. C. F. Tischner?

A. Yes.

Q. 71. And was formerly known as C. F. Tischner, Jr.?

A. Yes.

Q. 72. At how many spots were these specimen sheets or plates welded?

A. When you first asked me about this specimen I thought I recalled that it was fastened at one spot only but as you revive the subject it seems to me that there were several places where the plates were secured together.

Q. 73. In view of the fact that the affidavit in its second paragraph speaks of the affiant having "successfully practiced the method of fastening two sheets of metal together face to face by welding them at spots in their meeting surfaces," and in view of the further fact that the affidavit refers to the specimens as duplicates of those that had been so produced by the affiant, are you not mistaken in your inference that the specimens were anywhere near a quarter of an inch in thickness? Must they not have been very much thinner than a quarter of an inch?

A. I might be mistaken. It was a long time ago.

Q. 74. Well now, the affidavit also refers to an "accompanying electrode marked for identification 'Welding Electrode, D. M. Edsall, N. P.'" Do you recall what that looked like? If so, describe it to us.

A. All that I remember about that is that it was a piece of metal. The kind I do not recall—it might have been two or three inches long; the thickness I am very hazy about; and there was a sort of a taper towards one end which somewhat narrowed the extreme end to make it smaller than the reverse end. The dimensions I will not undertake to say what they were excepting in a most general way, to say that the piece of metal was not an inch in diameter as I know an inch.

Q. 75. Can you say that that electrode was not of copper?

A. No.

Q. 76. You think it was of copper, don't you?

A. I have no recollection.

Q. 77. It probably was of copper, was it not?

A. Why, so far as I know the art, I should say it probably was of copper.

Q. 78. Do you know what has become of that electrode?

A. No.

Q. 79. Did you ever make search for it or cause search to be made for it at the Patent Office?

A. Not that I recall.

Q. 80. Did Mr. Tischner ever try to find it in the Patent Office?

A. He told me at one time that he had looked for these Rietzel exhibits filed in connection with the affidavits and that they could not be found. That is all that I know about their existence.

Q. 81. The effect of the filing of this affidavit of February 18th 1909 by Rietzel was the short-circuiting, so to speak, of the Egel French patents, and the Harmatta British patent, and the granting of the patent to Rietzel with broad claims covering both the Egel disclosure and the Harmatta disclosure and that was the intention, was it not?

A. Yes, as I recall the circumstances, although perhaps I will not adopt your term of "short-circuiting."

Q. 82. The Rietzel patent issued July 20th 1909 and thereafter, to wit: on April 14th 1910, it was put in interference with a United States application of Harmatta filed December 3rd 1903, was it not?

A. The record will show.

Q. 83. When and under what circumstances did you first learn of the existence of this Harmatta United States application?

A. I don't recall.

Q. 84. Did you know of it before the interference between Harmatta and Rietzel was declared?

A. I think so.

Q. 85. How did you learn that?

A. I don't recall when first. The record may show something about it.

Q. 86. From what source did you receive your first information of the existence of the United States application of Harmatta?

A. I do not recall, Mr. Church. You might possibly refresh my recollection.

Q. 87. I have before me a certified copy of the record and proceedings in the matter of the interference between Rietzel and Harmatta, the same being Interference No. 31,792. In that interference Rietzel filed a preliminary statement verified June 7th 1910, in which he said "that he conceived the invention set forth in the declaration of interference during the latter part of October or first part of November 1897; that as near as deponent can at this time fix the date, the invention was successfully reduced to practice the latter part of July 1898 and at the same time was first explained and disclosed to others." Did you prepare that statement for Mr. Rietzel's execution?

A. I do not recall. If I did not it was prepared at my direction to embody the information furnished by the inventor or his Company.

Q. 88. Who did furnish the information as to the facts set up in this preliminary statement, Mr. Rietzel or Thomson Electric Welding Company or both?

A. I don't recall through just what channel they reached us.

Q. 89. All the work done by you on the Rietzel application was done in behalf of Thomson Electric Welding Company and paid for by that Company, was it not?

A. Yes.

Q. 90. Who connected with that Company were you in closest touch with regarding the applications which you were handling for that Company?

A. That is hard to say. Descriptions, as I recall, at that time were frequently sent by the executive officers of the Company. Sometimes Mr. Rietzel in the case of his inventions may have sent them himself. In case of other inventors I would say that they generally came direct.

Q. 91. Who was the officer of the Company with whom you did business, if with anyone?

A. William H. Hodges, who was Secretary of the Thomson Electric Welding Company.

Q. 92. I note that in the statement of Harmatta filed in this interference Rietzel vs. Harmatta, he refers to French patent No. 336,187 as embodying his invention and also to English patent 22,981 of 1903, published October 20th 1904 and granted August 25th 1904 as embodying his invention. On the face of the preliminary statements of the respective parties Rietzel was the prior inventor, was he not, of the subject-matter of the interference?

(By Mr. Stackpole: Objected to as calling for an inference of law.)

A. I think he set up earlier dates than the other parties

Q. 93. Your partner, Mr. C. F. Tischner, Jr., during the pendency of the interference between Rietzel and Harmatta, went to Europe and purchased the Harmatta application, did he not?

A. Yes.

Q. 94. And thereafter Rietzel, having defaulted in the taking and filing of testimony to establish his claimed date of invention, judgment went against him on the record and in favor of Harmatta? Is this not so?

A. I believe the record shows that fact.

Q. 95. And thereafter you revised the Harmatta application, re-writing the specification and claims, and then the Thomson Company had the Harmatta patent issued to itself as assignee of Harmatta? Is this not so?

A. The record shows as to the major portion of your question, I suppose. As to my personal act in preparing the specification and claims for Harmatta, it is my impression that I did so. Whether the final form was wholly mine I could not state positively although on reflection I am sure that I received my approval.

Q. 96. In your revision of the Harmatta application before permitting it to go to patent, you transferred to it many of the method

or process claims and all of the article claims of the Rietzel patent, did you not?

A. Yes, the record shows that.

(By Mr. Stackpole: Objection is taken to the entire deposition as irrelevant and immaterial and calling for hearsay testimony and for secondary evidence.)

Deposition closed.

Signature and certificate waived.

UNITED STATES DISTRICT COURT.

EASTERN DISTRICT OF MICHIGAN—SOUTHERN DIVISION.

THOMSON SPOT WELDER COMPANY, Plaintiff

vs.

FORD MOTOR COMPANY, Defendant.

IN EQUITY.

DEPOSITION OF ADOLPH F. RIETZEL, taken in behalf of the defendant, at the office of GEORGE FARNELL, 1314 Turks Head Building, Providence, Rhode Island, on the 6th day of January, 1919, beginning at 10 o'clock a. m., before GEORGE FARNELL, a NOTARY PUBLIC in and for the county of Providence and State of Rhode Island, pursuant to the annexed notice.

Present: J. L. STACKPOLE, Esq., for the plaintiff.  
ALEXANDER S. STEUART, Esq., HENRY H. SNELLING, Esq., for the defendant.

ADOLPH F. RIETZEL.

ADOLPH F. RIETZEL, having been duly sworn, deposes and says, in answer to questions by Mr. Steuart, as follows:

Question 1. Please state your name, age, residence and occupation?

Answer. Adolph F. Rietzel; fifty-five years old; occupation, mechanical and electrical engineer; residence, Charlestown, Rhode Island.

Q. 2. By whom were you last previously employed, if by any one?

A. By the Universal Electric Welding Company.

Q. 3. During what period were you employed by the Universal Electric Welding Company?

A. From August 1907 until November 1917.

Q. 4. Prior to such employment by whom were you employed?

A. By the Thomson Electric Welding Company, Lynn, Massachusetts.

Q. 5. How long were you employed by the last mentioned Company, and what were your duties?

A. I was employed by them from August 1888 until the 21st of June, 1907. During that period I was foreman, superintendent, engineer, manager and practically at one time conducted the whole business except that pertaining to the leases, which I could not sign, not being an official of the company.

Q. 6. Are you, and were you at the time of your last mentioned employment, a practical electrician as well as an electrical engineer?

A. As far as it pertains to electric welding matters I am and was.

Q. 7. Please give briefly what experience you have had as an electrical welder?

A. Well, I started in as foreman of the instrument department and from there was made foreman of the winding department and then the testing department was put under my charge, then I was made foreman of the entire machine shop and later had charge of the experimental department, after that was given charge of the engineering department, and finally was on the road to sell the electric machines, all for the Thomson Electric Welding Company.

Q. 8. In the performance of your work were you in the habit of operating electric welding machines yourself for any purpose, experimental or otherwise?

A. I was.

Q. 9. Are you the same Adolph F. Rietzel who filed an application for patent in the United States Patent Office on the 24th day of February 1905 (Serial No. 247,081) for improvements in uniting the component parts of composite sheet metal structures, which application resulted in United States Patent No. 928,701, dated July 20, 1909, a copy of which I now show you?

A. I am.

Q. 10. Your patent No. 928,701, or at least Claims 1, 2, 3, 4, 5, 6, 16, 17, 18, 19 and 20 thereof, was at one time in interference with the application of Johann Harmatta filed December 3, 1903 (Serial No. 183,677), for improvements in electric welding, which Harmatta application resulted in United States Patent No. 1,046,066, dated December 3, 1912, a copy of which I now show you was it not?

A. Yes, I believe it was in interference.

Q. 11. In that interference you filed a preliminary statement verified June 7, 1910, and a supplemental preliminary statement verified August 21, 1911, in which you stated that you had conceived the invention set forth in the declaration of the interference during the latter part of October or first part of November 1897, and that as near as you could at the time fix the date, you successfully reduced that invention to practice in the latter part of July 1898. Please describe what you did in the latter part of July 1898 in the

way of reducing the invention to practice, as stated in your preliminary statement.

A. I think it was in July 1898 that I joined together several pieces of steel the dimensions  $1\frac{3}{4}$  inches wide and  $\frac{1}{8}$  inch thick. I first joined these pieces together by lapping the ends over one another about  $\frac{3}{8}$  of an inch. I then placed them between the electrodes of an electric welding machine and welded them together across the whole section at one time, in other words, making one weld. This, however, did not answer the purpose which I had in mind. I then prepared an electrode one end of which was reduced to a diameter of about  $\frac{3}{8}$  of an inch. This electrode or contact as it is usually called was clamped on one of the electrodes of the welding machine, the other electrodes being flat and having a contact area of  $\frac{3}{4}$  of an inch by  $1\frac{3}{4}$  inches. The two pieces of steel which were  $1\frac{3}{4}$  inches wide,  $\frac{1}{8}$  inch thick, were placed between the aforesaid electrodes lapping over one another about  $\frac{1}{4}$  of an inch. I then welded these two pieces together at different points across the surface of the pieces as I remember. I think there were about five spots welded on the pieces; in other words, the difference between this specimen and the first one mentioned was that the first one was welded entirely across the whole surface of the pieces while the second specimen was only welded in spots. I welded a number of specimens like the second one referred to, that is, the one welded with spots only.

Q. 12. Please state whether or not it is a fact that the meeting faces of the overlapped portions of the metal referred to in your last answer, were plane smooth faces?

A. They were.

Q. 13. Then the sheets of metal acted upon were united by pressing them together and at the same time passing the heating and welding current from one to the other at a spot on their meeting surfaces which was restricted in area throughout the operation so as to leave on the meeting faces a well defined and comparative extensive area of no union completely surrounding said spots, were they not?

A. Practically so.

Q. 14. If this statement is inaccurate in any respect, please point it out?

A. I think it is correct.

Q. 15. Your said early work involved a method of welding two plates or sheets of metal together face to face between electrodes, consisting in restricting the area of contact of an electrode with said plates to a spot, passing a heating electric current from said electrode to the cooperating electrode through said spot to heat the work to welding temperature and applying pressure to the work in line with said spot to effect the welding of one plate to the other, did it not?

A. Well, as far as I could see, I should say yes.

Q. 16. The product or article produced in your aforesaid early work consisted of metal plates fastened together by a number of

distinct or isolated welds on their meeting surfaces and in spots comprising meeting portions of the metal plates, the backs of said plates being practically unaltered in their metallic conditions and the spots on the meeting surfaces being separated from one another by distinct unwelded areas, did it not?

A. It did.

Q. 17. All of this work that you have been speaking of took place and constituted the successful reduction to practice in the latter part of July 1898, as referred to in your preliminary statement, did it not?

A. It did.

Q. 18. When and to whom did you first disclose your invention as referred to in your previous testimony?

A. As far as I can remember, I am quite sure that I showed the pieces or the specimens that I welded to some of the employes in the welding department at that time. I can't state positively the names of the employes, but I am quite sure that I showed it to some of them.

Q. 19. Please give the names of some to whom you think you showed it.

A. I think I showed it to a Mr. Clark, or possibly—Robert Clark—and I think I showed it to a Mr. Charles Osgood. I can't recall any others, at that particular time.

Q. 20. What sort of a welding machine did you use?

A. It was one of an old type 10-A cast secondary type of the Thomson Welding Company, one of their regular butt welders.

Q. 21. Please describe its construction.

A. It was termed a type 10-A which signified that it had a kilowatt capacity of 10,000 watts. It was a horizontal type the frame being composed of cast iron having a bed, two side standards and a table. The transformer was composed of a secondary made of copper cast in one piece. The top of this secondary was flat and mounted on each end of the secondary was what we term platens, the left hand one of which was stationary, the right hand one of which was movable toward the left hand one, or away from it, movement being given to the right hand one by means of a lever attached to a toggle joint by means of which the pressure was applied to the work being operated upon. These platens were provided with suitable clamping or holding devices to suit the work to be operated upon. The secondary on its sides was grooved, and in these grooves or troughs the primary coils were placed and an iron core laminated was passed through a rectangular hole in the secondary.

Q. 22. Where is the machine now, if you know?

A. I do not know.

Q. 23. Were machines of this kind a regular product and made in any number by the Thomson Electric Welding Company?

A. They were.

Q. 24. Who made or prepared the electrodes used in this ma-



chine to perform the spot welding referred to in your previous testimony?

A. I can not say who made them, but they were some that we had in the welding department and used on various machines for various kinds of work. One of the electrodes that I used, which was the flat one, was a standard contact, as we term them, and could be used in various welding machines. The other contact, the one on which one end the area of contact surface was quite small in comparison with the other one, was one that we had used for a special job of welding work we had been doing, and I can not state who made this particular contact.

Q. 25. By contact, you mean electrode, do you not?

A. At that time the contacts above mentioned were not referred or called electrodes but presumably that is what it was.

Q. 26. In what respect did it differ from what we now know as the electrodes in a spot welding machine?

A. Why, this contact did not form a part of the welding machine, that is, not a fixed or even a removable part, but was simply clamped on top of another contact which was a part of the machine, in other words, the contacts I refer to were simply loose pieces of copper clamped on the terminals of a secondary but did not form an actual part of the welding machine.

Q. 27. Will you please describe, with as much particularity as you can, just the shape, dimension, and material of both the pointed and the flat contacts?

A. The flat contact was made of pure copper and was  $1\frac{3}{4}$  inches wide, about  $2\frac{1}{2}$  inches long, and  $\frac{3}{4}$  inch thick. The pointed one was about  $2\frac{1}{2}$  inches long,  $1\frac{1}{4}$  inches square, one end of this contact was reduced about  $\frac{3}{4}$  inch from its end to a diameter of about  $\frac{3}{8}$  inch round, the reduction being gradual from the  $\frac{3}{8}$  diameter back  $\frac{3}{4}$  inch to the  $1\frac{1}{4}$  diameter. In the end of this contact, the reduced end, a hole was bored about  $\frac{3}{32}$ " (three thirty seconds of an inch) in diameter and about  $\frac{5}{8}$  of an inch deep. This contact was also of pure copper.

Q. 27. Has any of the early work, spot welded as described by you, been preserved?

A. Not that I know of.

Q. 28. When did you last see any of it?

A. Do you mean that that I did in July, 1898?

Q. 29. Yes, or what was done by any one else at about that time?

A. I don't remember when I did see any of it last. I can not say.

Q. 30. What has become of it so far as you know?

A. Probably been scrapped.

Q. 31. Under whose instructions was the electric welding done in the manner described by you?

A. It was done by myself.

Q. 32. How often did you do it?

A. Why, I can't say how often. When I had a little leisure time



I used to do more or less experimenting for welding various things in the welding department. I couldn't say now at this time how often I did work of that nature. I can only recall one instance where I tried to join two pieces of steel about  $\frac{1}{8}$  inch thick in the same manner as described in my previous testimony, which I believe I did either in September or early October of the same year, 1898. That is all I can recall just now.

Q. 33. How, if at all, did you test the welds made in accordance with that process, to see if they were good welds?

A. By trying to pry the joint apart with the aid of a chisel and a hammer, also by clamping the pieces joined in a vise, clamping it as near to the welded portion as possible, and then trying to break it apart by bending it back and forth with a large hammer.

Q. 34. As a result of these tests were they shown to be good welds?

A. They appeared so.

Q. 35. How early was the spot welding of plane plates not provided with projections on either of their meeting faces, an established practice in the art, to your knowledge?

A. I don't believe I can give any definite time and date but I think it was three or four years after, or more, than when I made the first specimens. In fact, I only can remember of doing some commercial work, I think it was in the year 1906. There may have been some previous to that time but I can't recall now.

Q. 36. What concern, to your knowledge, first put out machines for spot welding plane plates?

A. That I can not say. To my knowledge I don't know what concern did.

Q. 37. You do know, do you not, that such machines have been manufactured and marketed?

A. I do.

Q. 38. When did you first learn of this fact?

A. As near as I can remember, I think it was some time in 1910.

Q. 39. What was the commercial work that you spoke of doing in the year 1906?

A. The welding of steel ferrules such as used on the end of rake and hoe handles.

Q. 40. How extensively was this practiced?

A. As I remember the first machine built by the Thomson Electric Welding Company was made in the year 1906, or it might have been the early part of 1907. This machine was shipped about that time and put into commercial use, and shortly after this machine was shipped, more followed.

Q. 41. Please describe its construction with respect to the electrodes and the means for clamping the work between the electrodes, if it embodied the latter feature.

A. This machine was known as the punch press type, as its construction was similar to that of an ordinary punch press, such as is used for punching various kinds of blanks and other kinds of

work of that nature. It had the usual cast iron frame, the bed of which was stationary, the upper portion was provided with cast iron ways into which was mounted movably a cast iron slide, which was operated vertically up and down by an ordinary crank shaft. A spring, however, was inserted between the throw of the crank and the side. The purpose of this spring when compressed was to apply the pressure necessary for welding the parts to be operated on. The machine had mounted in its frame an electric welding transformer of the flexible secondary type. On the bed of the machine was a copper plate, grooved; to this plate was fastened one of the terminals of the flexible secondary. In this grooved plate was a copper slide which moved laterally and operated automatically by a series of levers. This slide carried an electrode, the size of which was practically of the length and diameter of the inside of the ferrule. On this electrode the ferrule was clamped by suitable holding devices, but in this case the ends or the joint of the ferrule did not overlap each other, the ends simply butted each other. The cast iron slide carried a copper casting to which was fastened the other end of the flexible secondary. In the casting was clamped an electrode about 1 inch in diameter tapered at one end to about  $\frac{3}{8}$  inch diameter. Suitable circuit closing and circuit breaking devices were attached or formed a part of the machine, the operation being that when a foot treadle was depressed the machine would start in motion, the slide coming down and the round or pointed electrode meeting the lower electrode, between which electrodes the work was. The aforesaid spring was compressed at the same time the current turned on, the weld being completed, the circuit was broken and the slide returning to its place automatically moved forward to the next position for welding, and the operation thus continued. I want to make plain that in this particular work the ends of the pieces being welded were not lapped, neither was there any space between the points welded, so that when the article or ferrule was completed there was a weld practically along its entire length or joint.

Q. 42. In the case of this particular commercial work I understand then that successive spot welds were formed, but that they were so close together as to make practically a continuous line of welds. Is that correct?

A. That is correct.

Q. 43. Going back to the machine and the electrodes as you say you used in 1898, what was the object of the hole which was formed in the pointed electrode?

A. There was no object in it. It was in that particular contact which had been used for another purpose, and as this contact was about of the shape that I wanted to use in my experiments, and I did not want to make a new one, I used this one.

Q. 44. What was the purpose for which it had been used?

A. It was used for welding some small parts of, I believe, a sewing machine, one part of which was a steel punching about  $1/6$

inch thick on one end of which we welded a small stud. This stud had a small projection on one end and the other end was another projection of about  $\frac{3}{8}$  inch. The hole in the contact was used to locate the stud in its proper position for welding to the punching.

Recess for lunch.

A. F. RIETZEL  
THOMSON SPOT WELDER COMPANY

*v/s.*

FORD MOTOR COMPANY  
Defendant's Exhibit  
Rietzel Sketch

Afternoon session:

Q. 45. Still referring to this machine and electrodes, which you say you used in 1898 to do spot welding, I note in your full answer that you speak of the plates being overlapped only  $\frac{1}{4}$  of an inch. The electrodes which were pointed you say was  $\frac{3}{8}$  of an inch in diameter. This would mean that the electrode projected beyond the overlap, have you any explanation of this?

A. Your assumption is not right. The pointed electrode can be placed, if desired, so that its outer edge would be even with the edge of the piece on which it lays, or can even be further back if necessary, as long as you keep enough metal between the two electrodes. I could perhaps make this more clear, I believe, with a sketch.

Q. 46. That is a good suggestion, and I would ask that you make a sketch showing the overlapped pieces of sheet metal and the electrodes sufficiently to indicate the relative sizes?

A. I have made a sketch and describe it as follows: Fig. 1 is a front elevation showing two pieces of metal one overlapping the other and one of the plates resting on a flat contact, the other piece of metal laying on top of that one, and the pointed electrode resting on the top plate so that the edge of the electrode is on the edge or comes in contact with the edge of the top piece. Fig. 2 is a plan view of the pieces operated on showing where the welds were made.

Q. 47. Does this sketch represent substantially what you did in 1898 and referred to in your foregoing testimony?

A. It does.

The sketch made by the witness is introduced in evidence and marked "Rietzel Sketch."

Q. 48. Who prepared your preliminary statements filed in the Rietzel-Harmatta Interference No. 31792?

A. Townsend & Decker, New York City, New York.

Q. 49. Who furnished the data for the preparation of the statements?

A. I did.

Q. 50. Where was the statements prepared?

A. I am not sure whether they were prepared at the office of the Thomson Electric Welder Company or at the office of Townsend & Decker.

Q. 51. Was the machine or any of its product in existence at the time the preliminary statements were prepared?

A. I can not say as to that.

Q. 52. How is that?

A. Because I don't know whether the machine was still at the factory of the Thomson Company, or whether it was sold, or scrapped.

Q. 53. How about any of the product?

A. I do not know what became of them.

Q. 54. Who prepared the application for your patent No. 928701?

A. Townsend & Decker.

Q. 55. Where was it prepared, and who furnished the data?

A. I believe it was prepared in the office of Townsend & Decker, and all information thereto was furnished by me in person.

Q. 56. Was the original machine or the product of such machine in existence at the time of the preparation of the application?

A. I can not state positively as to the machine, but as to the product I know that it was not in existence, or at least I could not find it.

Q. 57. I notice that this application was filed in February, 1905, and illustrates in its drawings more particularly the formation of spots welds by the use of projections between the proximate faces of the sheets. Do you know of any reason why you did not mention in the application for this patent the spot welding of sheets without projections between the proximate faces?

A. Well, I might explain that by saying that at that time, that is, the period between 1896 and 1904 it was not the policy of the Thomson Electric Welding Company to apply for patents of any kind until such time as they had, or would expect in the immediate future, to receive an order for an electric welding plant for any particular or special purpose before applying for patents and as during the period between the fall of 1897 and the year 1904 we did not receive or have any problems put up to us by which use might be put to some of those experiments which I did in 1898 as regards the welding in spots, but in 1904 we had occasion to apply on a particular class of work the method of raising projections on the work to be operated on. As this proved highly successful at the very start it was decided to make application for patents on this subject-matter.

Q. 58. In the file wrapper of the application for your patent No. 928701, I notice an office letter under date of June 8, 1908, in which

attention is directed to the British Patent to Harmatta 22,981 of 1903. How much sooner than that date, to wit, June 8, 1908, if any, had your attention been directed to Harmatta, his British Patent or any spot welding work done by him?

A. I can not say whether I knew anything of Harmatta's application previous to that time, or even at that time, as sometimes I did not see the communications which Townsend & Decker had with the Thomson Electric Welding Company in the case. Oftentimes I was absent from the factory two or three weeks at a time and did not always see all correspondence which may have come to the office of the Thomson Electric Welding Company during my absence. While I believe I probably learned, or saw this communication approximately at or near the time that it was forwarded to the Thomson Company by Townsend & Decker.

Q. 59. Did, or did not, you know of Harmatta and his spot welding work through any source prior to the time when his patent was referred to by the Patent Office in your application?

A. Absolutely not.

Q. 60. You subsequently in the prosecution of your application made affidavits swearing back of the date of the Harmatta invention, did you not?

A. I know that I filed application but I did not think or even know that I was swearing back of Harmatta or any other application, I was simply requested by my attorneys that an affidavit was necessary in the prosecution of the case. They asked me to give them such information as I had and what I had done and approximate dates at which I did the various experiments. This information was given them and the affidavits prepared and executed by me.

Q. 61. I hold in my hand a certified copy of the file wrapper and contents in the matter of your application of the patent No. 928701, and I find therein an affidavit executed by you on the 23d day of October, 1908, reading as follows:

County of New York }  
State of New York } ss

ADOLPH F. RIETZEL, being duly sworn deposes and says that he is the applicant who filed the above entitled application for patent; that some time in June 1904 he successfully practised the invention in said application by uniting two halves of a sheet metal pulley in an electric welding machine at the shop of the Thomson Electric Welding Co., in Lynn, Mass.; that the piece of sheet metal herewith attached and marked: "specimen of pulley C. F. Tischner Jr. N.P." is a duplicate of one of the halves of the pulley to which he at that time applied the invention; that the contact points or projections formed in the sheet metal were in the first instance made by filing the metal to leave the contact points or projections, indenting not being available at that time, but that in subsequent operations

in which his invention was employed the projections were made by indenting the sheet metal, and that the invention was frequently practised by him successfully at the shop of said Company on a standard welding machine; that in conducting the operations on such machines he employed a pair of contacts fitted in the jaws of the machine and formed at their outer ends so as to fit into the cup shaped portion of the halves of the sheet metal pulley to be welded, thereby supporting the two halves with the contact projections engaged with one another; the two halves being in contact by the projections while assembled in the machine, electric current was caused to pass through the two halves by the contact projections, and pressure was then applied in the usual way practised in electric welding by the standard machine in which the operation in question was conducted; the operations above recited as conducted by him were uniformly successful and demonstrated clearly that the invention was complete in all particulars, and that the said invention has been since practised on innumerable occasions in substantially the same way for uniting pieces of sheet metal such as the halves of sheet metal pulleys of the form shown in the exhibit and of other forms and of other sizes, many of much larger size than that of the exhibit; that he does not know and does not believe that the invention aforesaid has been in public use or on sale in this country, patented or described in a printed publication in this or any foreign country for more than two years prior to his application and that he has never abandoned the invention.

ADOLPH F. RIETZEL

Subscribed and sworn to by the aforesaid Adolph F. Rietzel before me this 23d day of October 1908.

C. G. TISCHNER, JR.,

(Seal)

*Notary Public.*

NOTARY PUBLIC, KINGS COUNTY,  
CERTIFICATE FILED IN NEW YORK COUNTY

Do you recall this specimen of sheet metal referred to in that affidavit as specimen C. F. Tischner, Jr. N.P.?

A. I do.

Q. 62. Please describe how the pulley referred to in the affidavit was made?

A. Why, it was made of sheet steel of about 1/16 inch thick, and was formed up in such a shape that when two of the pieces were united it formed a grooved pulley.

Q. 63. In the affidavit you say that the contact points or projections formed in the sheet metal were in the first instance made by filing the metal to leave the contact points or projections. Were these projections thus produced formed upon both of the cooperating halves of the pulley?

A. They were.

Q. 64. Did the projections upon the respective naives contact with one another and did the welding take place between such contacting projections?

A. They did, and the welding took place at those projections only.

Q. 65. Do you know what has become of the specimen referred to in, and which accompanied that affidavit?

A. I do not. The last I saw it was when I turned it over to Townsend & Decker.

Q. 66. Have you in your possession, or has there been preserved anywhere to your knowledge, any of the pulleys welded together in accordance with the plan set forth in the affidavit?

A. There may still be some in existence but I don't know where they are. There was quite a number of them welded.

Q. 67. Where were they welded?

A. At the factory of the Thomson Electric Welding Company, Lynn, Massachusetts.

Q. 68. Was this work done in your own behalf or in behalf of the Thomson Electric Welding Company?

A. It was done on behalf of the Thomson Electric Welding Company but I did the work even to preparing the first sample and welded them the same day that the samples were presented to us and at the same time I gave instructions to the party who submitted these samples as to how to prepare the next lot which he was to send us.

Q. 69. Briefly what were these instructions?

A. The instructions were to have the next lot of stampings prepared with small projections at a number of points around the circumference. These instructions were given verbally and a sketch was made on the visiting card of the party who brought the work to us.

Adjourned to the office of Messrs. Fish, Richardson & Neave, 84 State street, Boston, Mass., at 10:00 a.m. Tuesday, January 7, 1919, by agreement of counsel.

At the Office of  
Fish, Richardson & Neave,  
84 State Street, Boston, Mass.  
January 7, 1919, 10 A.M.

Met pursuant to adjournment.

Present: Counsel as before.

*(Direct examination of Mr. Rietzel continued.)*

Q. 70. Who was the party to whom you gave the instructions?

A. I think his name was Knipe.



Q. 71. If he was connected with any concern?

A. I think it was the Knipe Mfg. Company but do not know how extensive a company it was.

Q. 72. Did you or the Thompson Electric Welding Company furnish them with machines for welding these pullies?

A. We did not.

Q. 73. Did anyone to your knowledge do so?

A. Not to my knowledge.

Q. 74. In this affidavit executed by you on the 23rd of October, 1908, you refer to your work on pullies in 1904, why did you not refer to your earlier work of 1897-8?

A. I don't know why I did not.

Q. 75. Was it a failure to do so by advice of counsel.

A. I think not.

Q. 76. Did you or your counsel prepare the affidavit?

A. The counsel prepared it but I outlined the facts.

Q. 77. In the file wrapper of your application for your patent 928721 I find another affidavit filed March 13, 1909, and verified on the 18th day of February, 1909, which reads as follows:

#### AFFIDAVIT

County of New York }  
State of New York } ss:

ADOLPH F. RIETZEL, being duly sworn, deposes and says, that he is the applicant that filed the above entitled application for patent;

That prior to the 18th day of February, 1904, he repeatedly, successfully practised the method of fastening two sheets of metal together face to face by welding them at spots in their meeting surfaces by confining the heating electric current passed from one plate to the other in such spots and localizing the welding pressure at said spots, as claimed broadly in said application;

That the work of so uniting such sheets of metal was done at the factory of the Thomson Electric Welding Company at Lynn, Massachusetts, on a Welding Machine of a commercial type known as type 10 A Welder;

That said Machine was the same in construction as the machine known as type 5 A Welder but of larger size and was identical with that shown on the attached page removed from a catalogue of the Thomson Electric Welding Company, which page is identified and marked "Page of Catalogue, D. M. Edsall, N. P.";

That the accompanying pieces of work marked "Specimen No. 1, D. M. Edsall, N. P." and "Specimen No. 2, D. M. Edsall, N. P." are duplicates of work so done by him on that ma-



chine prior to the 18th day of February, 1904, but that the original specimens were not preserved;

That in doing such work he employed a pointed electrode, the same in form as the accompanying electrode marked for identification "Welding Electrode, D. M. Edsall, N. P.", which Electrode was clamped in one of the holders of the machine and was used to apply the localized pressure and heating current to the plates which were welded together at spots in their superficial area, the opposite or backing electrode being a block of metal which was flat and of a superficial area, approximating the area of the plates which were welded together and which opposite electrode was clamped in the opposite holder of the machine;

That in this operation the two plates superposed upon one another were inserted between said electrodes and the pressure and heating current localized as claimed were applied by forcing the pointed electrode against the outside face of the plates and pressing them between said pointed electrode and the opposite flat electrode, current being at the same time passed from one electrode to the other and pressure being applied by employing the usual devices forming a part of the machine and used in the ordinary operation of the machine for applying welding pressure to the work;

That work was repeatedly and successfully done in this manner upon various sizes and pieces of metal plates, none of which however, are now existence so far as affiant has been able to discover;

That the work done by him as aforesaid, demonstrated the complete success of the operation and that metal plates could be successfully and firmly united together by distinct or isolated electric welds forming welded spots of union in their meeting faces and constituting in effect a successful substitute for a union of the same by a number of rivets.

ADOLPH F. RIETZEL

Subscribed and sworn to before me this 18th day of February, 1909.

DAVID M. EDSALL  
*Notary Public*  
N. Y. Co.

What was that you refer to that you repeatedly successfully practiced prior to the 18th day of February, 1904, as referred to in the second paragraph of this affidavit?

A. I referred to the work which I did in July, 1898, and which I have referred to previously in this testimony, also to some work which I did in September or October of 1898.

Q. 78. Please describe what you did in Sept. or Oct. of 1898.

A. I attempted to weld some plough share blades which were

brought to us to be welded together, these blades were of an uneven thickness but the average thickness was about three thirty-seconds of an inch. These blades were placed on top of one another and I tried to weld them in the same manner using the same kind of contacts that is, one had quite large flat surface while the other was pointed at one end. I was not, however, able to make successful welds on these specimens and I abandoned its use on that particular work. A few days after I continued my experiments with various pieces of steel varying in thickness from one-sixteenth to one-eighth of an inch, and it is this work and that I did in July of the same year that I refer to, in this affidavit.

Q. 79. Was this work you speak of doing after the plough share blades successful, and was it the welding of spots of comparatively small areas between plane proximate faces of the article?

A. I considered the experiment fairly successful and the area welded were comparatively small and isolated, these pieces were simply experimental no attempt being made in placing the pieces one upon the other to have any definite lapping over, it was simply trying the results of this method of welding on various kinds of steel.

Q. 80. Where was this work done?

A. At the factory of the Thompson Electric Welding Co., Lynn, Massachusetts.

Q. 81. What became of the electrodes that were used in this work last referred to by you?

A. I do not know.

Q. 82. Were any specimens of that work preserved?

A. I don't think so.

Q. 83. Were the plough share blade samples returned to whoever handed them over to you for welding?

A. They were, except a section or a piece of the welded plough share, but these shares were welded by punching up points or projections and were not welded with a pointed electrode, but special electrodes were made to weld the share and the area of contact was considerable as compared with what is termed a pointed electrode.

Q. 84. These welded plough shares or blades were the ones that were returned?

A. They are.

Q. 85. Who was the party to whom you furnished the plough share or blades or to whom they were returned?

A. I believe his name was LaDow.

Q. 86. Was this one of the LaDows who manufactured agricultural implements at Dayton, Ohio?

A. I don't know.

Q. 87. Would any of the company records show whether or not such was the fact?

A. I don't know.

Q. 88. Was the type of welder employed in these operations referred to in this affidavit, that shown on the page of catalog ac-

companying the affidavit and marked "Page of catalog D. M. Edsall, N.P."

A. It was exactly the same type, same construction, but was of double the kilowatt capacity and was termed type 10 A.

Q. 89. The affidavit refers to accompanying piece of work marked "Specimen No. 1 D. M. Edsall, N.P." and specimen No. 2 D. M. Edsall, N." as duplicates of work done by you on that machine prior to the 18th day of February, 1904, what if you know has become of these specimens?

A. I do not know what has become of them, the last time I saw them was in the office of Townsend & Decker at or about the time this affidavit was filed.

Q. 90. Who prepared them?

A. I had the contacts or electrodes and the specimens prepared under my instructions at the factory of the Thomson Electric Welding Company, but I personally welded these specimens.

Q. 91. At about what date was this?

A. It must have been a few days or weeks prior to filing the affidavit in question.

Q. 92. Do you know where the electrodes referred to in the affidavit are?

A. I do not.

Q. 93. Have you the counterparts of those specimens or of those electrodes in your possession, or do any such exist of which you have knowledge, and if so where are they?

A. I have not got them in my possession, neither do I know who has them or where they are.

Q. 94. Was the work which you have above referred to in connection with plough shares or blades with punched up projections the first welding work you had done in which projections were used to localize and restrict the area of the welding points instead of a pointed electrode?

A. I think it was.

Q. 95. The spot welding by the use of a pointed electrode for localizing the area of the weld between plane proximate sheets then preceded the use of projections between the proximate faces of the sheets in your development of the invention?

A. Apparently so.

Q. 96. Please state what your definite recollection on that is?

A. My testimony shows it.

Q. 97. Which gave the stronger weld, the welding of plane plates or the welding of plates provided with projections?

A. Theoretically two specimens using equal conditions that is to say the welded areas on each specimen being exactly the same, I should say there was no difference, one would be of the same strength as the other, but in practice and doing commercial work, more uniform and therefore better and stronger work would be obtained by using the projection method.

Q. 98. Does this accord with your actual experience, as determined by your earlier work about which we were talking?

A. It does.

Q. 99. Referring to the two affidavits filed with your application, who prepared them and where were they prepared?

A. They were prepared by instructions and the data given by me to Townsend and Decker. Where they were prepared I can not state positively whether they were prepared at their office in New York or at the office of the Thomson Electric Welding Co. but I think they were prepared at Townsend & Decker's office.

Q. 100. Was the data and the questions in the form of written or verbal communication?

A. Given verbally.

Q. 101. And to which member of the firm of Townsend & Decker received them?

A. To Charles F. Tischner, Jr.

Q. 102. I notice that these affidavits were executed by you in New York. Did you go to New York for the purpose of giving the data and instructions and at that time executing the affidavit?

A. I probably did.

Q. 103. What is your best recollection of this?

A. I did as near as I can remember.

Q. 104. Are you the patentee of patent No. 1,041,351 dated Oct. 15, 1912, application filed Dec. 26, 1906, construction of sheet metal utensils.

A. I am.

Q. 105. Did you ever practice the invention of that patent and if so to what extent and when?

A. Did not practice it at all, but that patent was applied for on the ideas and from my observation that such work could be successfully done. I might modify the first part of the answer, I did experimental welding by welding together as described in the patent just pieces of scrap metal just to satisfy myself that the invention carried out was practical.

Q. 106. When did this idea first occur to you?

A. I can not recall the exact time now but it must have been shortly before the application was filed or about the time the application was filed.

Q. 107. There are no projections on the proximate faces to be united disclosed in this patent, are there?

A. I don't think so.

Q. 108. Is one of the electrodes (5) of this patent reduced in area at the contact end or not?

A. It is only reduced in area insofar as it had to be made to conform to the work which was to be welded, and not for the purpose of reducing the contact area for localizing the heat, as for instance, if 3 had been a flat piece instead of an irregular shape a flat contact of considerable area would answer the purpose intended.

Q. 109. Do you know of any commercial use whatever of this

invention of this patent or of utensils welded in accordance with the disclosure of the patent or of machines designed for such welding?

A. Not that I know of.

Q. 110. Do you know of any commercial use of spot welding for attaching bail ears or handles to utensils or receptacles and if so please state what it is?

A. I do not quite understand what you mean by spot welding, whether the articles to be welded have been prepared with projections or whether they have not been prepared and welded by what is termed the electrode weld. If the latter case is meant I know that a great many machines are in use for this class of work, but can not say that I have seen any in operation, nor can I state positively in what factories they are being used, if you refer to such articles welded by what is known as point welding, that is, preparing the work to be acted upon with points or projections I can say that there was a concern that was doing this work and I personally saw the machines in operation.

Q. 111. About when was it and where was it that you saw these machines?

A. At the factory of the New England Enameling Company, Middletown, Connecticut. I can't give the exact time but my recollection is the latter part of the year 1906 or early 1907.

Q. 112. Did the Thomson Electric Welding Company furnish the machines?

A. The Thomson Electric Welding Company leased the machines to the Universal Electric Welding Company who in turn subleased them to the Enameling Company, above referred to.

Q. 113. What was the Universal Electric Welding Co. and when was it organized?

A. As I remember the Universal Electric Welding Co. was originally the Standard Pulley Company of New York, when they changed their name I do not remember. Their business I believe was the manufacture of sheet steel pullies of all kinds and later they went into electric welding under a lease from the Thomson Electric Welding Company.

Q. 114. When if you know did they begin to manufacture sheet steel pullies?

A. I don't know when.

Q. 115. When did you first have any knowledge of their manufacture of sheet steel pullies?

A. In the year 1904.

Q. 116. What were they doing then and how did you obtain knowledge of it?

A. I don't know exactly what they were doing except they were making some small steel sheaves or pullies, and I first heard of them through their President, Maurice Lachman. I think it was August 1904.

Q. 117. What did he do or say at that time which acquainted you with other things they were doing or wanted to do.

A. He brought with him at the time of his visit to the factory of the Thomson Electric Welding Company six or eight parts of pullies which he wished to have welded together if possible.

Q. 118. What if anything did you do or tell him you could in connection with the welding of such pullies?

A. The parts of pullies which he brought with him were not prepared properly so that they could be successfully electric welded. I then explained as to how they could be welded by forming projections on the surfaces which were to be joined. This I did with an ordinary prick punch and hammer and I welded, in his presence the parts of pullies which he brought up. These results pleased him very much and he subsequently came again about ten days later with more parts of pullies prepared as per the instructions I gave him in his previous visit. These parts were welded together and the results were highly satisfactory.

Q. 119. I show you now a copy of a patent to L. S. Lachman, No. 904,540, dated Nov. 24, 1908, and ask you if the sheet metal pulley shown therein and particularly as shown in figures 1, 2 and 3 is substantially the pulley referred to by you as above given in your testimony?

A. It is not exactly the same but practically the same as far as the projections are concerned, but not as to the design of the pulley.

Q. 120. Among the title papers offered in evidence by the plaintiff in this case there is an agreement dated June 17, 1909 between Thomson Electric Welding Company and Universal Electric Welding Company in which reference is made to an interference between "the application of Adolph F. Rietzel serial No. 247,081 (which is the application resulting in your patent of July 20, 1909) and the application of Maurice S. Lachman, serial No. 133,109 owned by the Universal Electric Welding Co." Do you recall the fact of that interference between your application and the application of Lachman referred to?

A. As I remember there was such an interference but I did not know until now that an agreement had been reached between the Thomson Electric Welding Co. and the Universal Electric Welding Company.

Q. 121. How was that interference terminated or do you recall anything in connection with it?

A. That I do not know.

Q. 122. Do you recall ever seeing the Lachman application in the interference or a copy of the same or that anyone explained to you what was embodied therein?

A. I did not see a copy of the Lachman application but I learned that there was an interference declared with my application serial No. 247,081, and as I remember the matter was adjusted but how and on what terms I did not know.

Q. 123. When Mr. Lachman the president of the Standard Pulley Manufacturing Company brought the pieces of pullies to you



did you or did you not suggest to him that they might be welded together in spots with the use of a pointed electrode or contact rather than with the use of punched up projections in the metal of the pulley?

A. I did not suggest the use of such an electrode.

Q. 124. Why not?

A. Well one reason might be that I didn't think of it, then I didn't think it was practical to use such an electrode and that by the use of projections the pulleys could be more readily welded as the conditions for successful electric welding were better by the use of projections on these particular pulleys than any other method I could think of at that time.

Q. 125. In addition to the patent to L. S. Lachman No. 904,540 Nov. 24, 1908 filed March 24, 1905 I call your attention to patent to L. S. Lachman No. 828,033 dated August 7, 1906 filed July 28, 1905 and in which at the end of the specification there is reference to a copending application filed by Lachman Nov. 17, 1904 serial 333,109. The latter application is the one I understand which was in the interference referred to by you. When were you first informed of Lachman's claim of inventorship of the subject-matter of the patent in application. In this connection I will call your attention to claim 1 of patent 904,430 and to the further fact that Lachman in a British patent No. 23,077 of 1905 made the following claim.

"The process of fastening sheet metal plates together face to face over their plane surfaces by a multiplicity of distinct electric welds or unions made by providing over the surfaces a multiplicity of contact spots and then applying pressure to the plates while included in an electric circuit."

A. All that I can say is that I probably was informed of the interference at the time or shortly after it was declared by the patent office. As I remember I did know that Lawrence S. Lachman did make an application for a patent to be granted him on the making of the details or any of the dates at which the application or applications were filed. In reference to the interference I might state that it was probably called to my attention through Thomson's attorneys, Townsend and Decker and that I subsequently gave them a history of the subject matter in question, at or about the time the interference was declared.

Q. 126. Please state as near as you can the date when you first learned of Lachman's claim of inventorship?

A. I think it was the latter part of 1907.

Q. 127. What was the relationship between Mr. Maurice Lachman and Mr. Lawrence S. Lachman, either blood relationship or business relationship?

A. The blood relationship, as far as I know, Maurice Lachman was the father of Lawrence S. Lachman, business relationship was friendly, or cooperative. Maurice Lachman was president, I be-

lieve Lawrence Lachman was secretary, of the Standard Pulley Company.

Q. 128. Prior to the time when Mr. Maurice Lachman brought you the pulley parts and you welded them together in spots and disregarding the work you did in 1897-8 please state briefly what similar work you did between those two periods?

A. I welded a number of pullies on which projections were formed in the early part of June, 1904 and about a month later welded another lot I should say two hundred or more, these pullies were of the same shape and size as the specimen pulley referred to in my affidavit executed by me on the 23rd day of October 1908 with the exception that the two hundred or more pullies which I welded had projections formed on them. I don't remember or can not recall of doing any other work between those dates mentioned, in your question.

Recess.

Q. 129. Was there any machine made to your knowledge for welding the pulley parts together such as those made by the Standard Pulley Manufacturing Company?

A. There was.

Q. 130. When and by whom?

A. I think it was built in the years 1905 and 1906 and built by the Thomson Electric Welding Co.

Q. 131. Please state if you know to whom it was sold or leased and whether or not it went into commercial use?

A. It was leased to the Standard Pulley Mfg. Company and they subsequently sub-leased it to the American Pulley Company of Philadelphia, Pa. and was put in commercial use by them.

Q. 132. Do you know whether the Standard Pulley Mfg. Co. used it for manufacturing welded pullies?

A. I don't think they used it for welding any of the pullies that they were making at that time, so far as I know.

Q. 133. Did they make any use of it as far as you know and if so what was that use?

A. The only use I know that they put this particular machine was for welding samples and various lots of pullies before shipping it to the American Pulley Company, my recollection is that when the Standard Pulley Mfg. Company ordered this welder from the Thomson Company they stated that it was to be leased to the American Pulley Company but instructed us to ship the machines to their plant in New York City where they would test it out before shipping it to the American Pulley Company.

Q. 134. When did you first learn that Harmatta had obtained his patent 1,046,066?

A. Just now, today.

Q. 135. Did you not know before this that in the Rietzel-Harmatta interference which was declared between your patent No. 928,701 and the Harmatta application serial No. 183,677 had re-



sulted in a judgment of priority in favor of Harmatta and that his patent with the claims in issue of that interference had been issued?

A. I did not.

Q. 136. And did no one notify you in respect to the final outcome and result of that interference?

A. No, sir.

Q. 137. In welding two plates one of which is flat in plane and the other of which is provided with a projection according to the disclosure of method of your patent 928,701 is there or is there not a localization of the pressure and current at the point of welding?

A. There is.

Q. 138. In welding these plates, both of which are flat in plane by the application of two pointed electrodes or by application of a flat electrode on one side and a pointed electrode on the other side is there or is there not in like manner a localization of pressure and current at the point of weld?

A. There is.

Q. 139. In both instances then is not the effective welding heat generated principally at the point of contact and pressure between the plates?

A. It is.

Q. 140. Do you know Prof. Thomson and if so how long have you known him?

A. I do know him and first got acquainted with him or came in personal contact with him in the fall of 1888.

Q. 141. Did you ever discuss with him the spot welding of plates provided with projections, and if so when did you first discuss it with him?

A. I did discuss it with him and I should say it was shortly after the second visit of Maurice Lachman to the factory of the Thomson Electric Welding Company which I think was about October 1904.

Q. 142. Did you ever discuss with him the subject of spot welding plane plates unprovided with projections, and if so when did you first discuss the matter?

A. On one occasion only, the exact time I cannot tell you, but it was five or six years after I left the employ of the Thomson Electric Welding Company.

Q. 143. Did you ever file any application for patent for improvement in electric welding process or apparatus that did not result in a patent or patents?

A. I think not, all applications I made in the Patent Office have been allowed except those which have been lately filed and which are still pending.

Q. 144. Please tell us how it was that you came to first practice the process of welding plane plates together by means of a flat electrode on one side and a pointed electrode on the other side?

A. This matter was brought to my mind when I made a trip throughout the West visiting the plants of the various licensees of

the Thomson Electric Welding Company, this trip being my initial one and being made for the purpose of learning what troubles the various licensees were having if any with a view in mind to correcting these troubles in future welding machines which the Thomson proposed building. The trip was also made with a view to assisting the various licensees with their products they were producing with their welding machines. In one particular instance one of the users of the Thomson Welding machine complained somewhat as to the expense of removing the burr or fin which is produced when making a butt weld. The particular work that these people were welding and which they complained of the most was the welding of hub bands, and which they made a great many of. The method of welding these bands was to abutt the ends of the bands heating that section which projected from the contacts of the welding machines and when the metal between these contacts was at a plastic state pressure was applied and the weld completed. In applying this pressure surplus metal is squeezed up at the point of union and as this surplus metal or burr or fin was objectionable and the articles could not be used with this fin on them it was necessary to remove it either by grinding or chiseling or machining it off after the welds were made, or while still hot put under a press or a hammer and the fin or burr reduced in that manner. The first method that of chiseling or machinery was expensive, the second that by pressing or hammering was dangerous as it greatly weakened the joint. It was then or shortly after that trip I began to think what could be done as to the welding of the hub bands not only for this particular concern but for the general business I concluded to try lap welding. I wish to have it understood here, at that time to my knowledge nothing was known of spots, points, or projection welds. All that was known at that time was butt welding. I then conceived the idea of taking these bands overlapping their edges about one-quarter or two three-eighths of an inch placing the ends so lapped between two copper electrodes or contacts of approximately the same surface area or width as the work itself, then passing a welding current through them and when the metal was at a plastic state apply the pressure and complete the union. I found that this method was not practical for the reasons that it took a great amount of current and would prohibit its commercial use for at that time electric current was not available in such quantities or at such low prices as they are now and many instances they did hardly have enough steam power to operate these welding machines. It then occurred to me that I might possibly be able to accomplish the desired result by making a series of local welds across the plane faces of the overlapped edges of the band. This I carried out as explained previously in this testimony. The results however, were not sufficiently good for the purpose of welding these bands, in the first place the area welded was a great deal less than the area welded when the bands were butt welded and consequently they were not strong enough to stand the strain put upon them when put to their proper use, furthermore the object of this idea was to elim-

inate or reduce as far as possible the burr or fin thrown up in butt welding, but the specimens welded locally had the same objection that when the band was completed the joint was still overlapped and sufficiently high as to preclude its use for commercial purposes. I consequently gave up experimenting along that line as I did not consider it a success with that particular job and while I made or welded several pieces of sheet metal of various thicknesses together at the same time that I was making these experiments I did not go into it further as I did not see at that time where I could apply that style of welding on any of the work which we had in hand at that time, until as I stated in my previous testimony in September and October of that same year 1898 I attempted to weld some samples or a sample of plough share blades which was submitted to us by Mr. LaDow but which experiment did not prove satisfactory. As far as I can remember there had not been presented to us any work to which this style or method or welding might have been applied or if there had been I did not see it at the time.

Q. 145. What is your recollection with respect to the size, thickness and material of the plough share blades submitted by Mr. LaDow?

A. On Mr. LaDow's first visit he only brought with him a piece of a plough share which had been previously braised together as near as I can recollect there were two plates, one on top of the other the length of which were about eight inches, the width about two inches the thickness varying possibly from an eighth of an inch to a sixteenth of an inch, the plates were bent on a slight curve and I believe were made of a high carbon steel. The other two samples which Mr. LaDow brought with him at a later date I did not see, but I understood they were full size plough share blades. These blades were welded at the factory of the Thomson Electric Welding Company during my absence from the factory, but were made as per my instructions which I left before leaving on the trip I was going to make, knowing or expecting that Mr. LaDow would call with his samples before I returned which was the case.

(By Mr. Stackpole: So much of the answer as relates to what the witness did not see is objected to as hearsay.)

Q. 146. Please tell us what your instructions were with respect to the welding of these plough shares?

A. To weld them the same as I have welded the first sample that Mr. LaDow brought with him by punching up points on the samples and then welding them.

Q. 147. To whom were these instructions given?

A. To Mr. Robert Clark.

Q. 148. Then I take it that he was familiar with the work you had already done along this line?

A. Well he was inasmuch as I showed him the sample which I had previously welded for Mr. LaDow, I might add that Mr. Clark

did all the job welding which came into the Thomson Company and had charge or was foreman in that department and he also did considerable sample and experimental welding under my instructions.

Q. 149. I take it that you were absent from the works for comparatively long intervals between the time referred to in your answer to question 145 (when you were absent from the factory) up until 1905 to 1907. As Mr. Clark was familiar with this kind of work is it not entirely probable that he would do other samples according to this spot welding method during your absences?

(By Mr. Stackpole: Objected to by Mr. Stackpole as calling for hearsay evidence and for a mere opinion.)

A. Can say that from 1897 until the time I left the employ of the Thomson Electric Welding Company I have been absent from the factory a great many times varying from two days to possibly three weeks at a time, usually just before I went off on these trips I left certain instructions to the various foremans of the different departments as to about what they should do and often times I left instructions to Mr. Clark to weld certain samples that may come in during my absence, but unless he was told specifically to weld them he did not weld any samples which may have come in during my absence and on which he did not have any instructions. Up to 1905 Mr. Clark or anybody else knew little or nothing as to projection or the so-called electric welding. Of course, I can not state that he did not do anything in this line if he did or any one else they never told me of it.

Redirect examination closed.

*Cross-examination by MR. STACKPOLE.*

X-Q. 150. Did you make the samples by the method illustrated in defendants exhibit Rietzel sketch at your own initiative or at the instructions or someone else?

A. I made them of my own initiative.

X-Q. 151. Did you inform the officials of the Thomson Company of this work?

A. I did not.

X-Q. 152. Did you show any samples of this work to the officials of the Thomson Company?

A. I did not.

X-Q. 153. So far as you know what knowledge did the officials of the Thomson Company have of this work at that time?

A. Not any to my knowledge.

X-Q. 154. Am I correct in understanding that the result of the work, that is the welded hub bands were unsuitable for use as hub bands?

A. They were not suitable for the purpose intended.

X-Q. 155. As shown in defendants exhibit Rietzel sketch the welds are made at the edges of the overlapped portions. Do you remember whether at the welds the metal of the upper piece was squashed down or not?

A. It was to some extent.

X-Q. 156. Do you remember whether there was metal squeezed out between the pieces at or near the welds?

A. Yes there were, the upper piece or the piece on which the pointed electrode operated showed the most metal disturbed or heated. The electrode itself penetrating the upper plate comparatively deep.

X-Q. 157. As I understand it you thought of using this pointed electrode to make several welds in place of a single electrode to make one continuous weld as a means for saving current over that first method? Is that so?

A. That is exactly right.

X-Q. 158. Was it part of your object in making your experiments with the overlapped ends of the hub bands to squash down the ends so that they should lie in the same plane?

A. The object was that and also as stated in the previous question to save current. In order that the bands could be commercially used it was necessary that the overlapping edges of the band should be in approximately the same plane when finished.

X-Q. 159. Inasmuch as the bands thus welded by you were useless for their intended purpose was there any reason for keeping them?

A. There was not, they went in the scrap pile almost immediately.

X-Q. 160. After you had done this work in July, 1898, when did you next attempt to weld plane sheets between two electrodes one of which was pointed except for the unsuccessful attempt to weld plough share blades in the fall of that year to which you have referred?

A. I think I experimented a little further either the same day that I experimented on the plough share blades or the next day or possibly the second day after, I know it was immediately after I tried to weld the plough share blades. The pieces that I experimented on were pieces of scrap stock picked up in the factory and welded together without any attempt at any particular form or shape.

X-Q. 161. After 1898 did you abandon this process of welding until 1905 or thereafter?

Objected to as calling for a legal conclusion.

A. Can state that I don't recollect of doing anything more in that line though still having the matter in mind. At that time I was an extremely busy man and did not get much time for experimental purposes. The business of the company expanded rapidly so much so that just at that period we contracted out as much as 40% of the capacity of our factory. The nearest approach of doing anything

near to that was the welding of those furrules to which I referred to in my previous testimony in the year 1906.

X-Q. 162. After the year 1898 when did you first have occasion to make practical use of the projection method of welding?

A. In June, 1904, when I welded some small pullies brought in by a Mr. Knipe.

Cross-examination closed.

*Redirect-examination by MR. STUART.*

Re-D. Q. 163. In your answer to X-Q. 152 and 153 you state that you did not inform the officials of the Thomson Company of your spot welding work nor did you show them any samples of this work. Do you mean at any time up to this date?

A. No, I called to the attention of the officials of the company of various ideas which I may have thought up or experimented with, but only as near as I can now remember during the last two or three years in my connection with them, the reason for this is that I practically managed and run the factory and did nearly all the business with the exception of signing leases or special contracts and that the officials of the company usually left those matters to my judgment. The officials with whom I had to deal with mostly were the president of the company, Mr. B. F. Spinney, and Mr. Wm. H. Hodges who was secretary and treasurer of the company. Neither of these gentlemen were practical men or knew much about mechanics or even electric welding. I consulted with Elihu Thomson, who was consulting engineer of the Thomson Electric Welding Company at various times but as a rule I never consulted with any of the officials of the company on any new or experimental work both as to the method of welding or designing electric welding machines until such time that I had in my own mind decided that the particular experiment or machine was a practical or commercial success.

Re-D. Q. 164. How do you reconcile your answers to X-Q's 160 and 161 with the statements in your affidavit filed in your application for patents and executed on the 15th day of February, 1909, in which you say "That prior to the 18th day of February, 1904, he repeatedly, successfully practiced the methods of fastening two sheets of metal together face to face by welding them at spots in their meeting surfaces by confining the heating electric current passed from one place to the other in such spots and localizing the welding pressure at such spots, . . . . . that work was repeatedly and successfully done in this manner upon various sizes and pieces of metal plates, . . . . .

"That the work done by him as aforesaid, demonstrated the complete success of the operation and that metal plates could be successfully and firmly united together by distinct or isolated electric welds forming welded spots of union in their meeting faces and

"constituting in effect a successful substitute for a union of the same by a number of rivets."

A. I can answer that by saying that I did weld various pieces of sheet metal together by using the pointed electrodes as one and a flat electrode as the other but only so far as I can remember now at the times mentioned that is in July, 1898, and again in September or October, 1898, I considered some of the welds that I made satisfactory and successful but did not consider it a commercial or practical experiment at that time.

Re-D. Q. 165. Why do you now call it an experiment and in 1909 when you executed your affidavit you called it a successful demonstration or reduction to practice of the invention?

(By Mr. Stackpole: The question is objected to as misstating what the witness said in his affidavit insofar as the work therein referred to is called a reduction to practice.)

A. I will state that possibly in fact can say that I didn't know and don't know what reduction to practice really means and this affidavit referred to was prepared by my attorney Townsend & Decker from the instructions or data which I gave them and which is substantially the same as I have testified here and I executed those papers thinking that it was correct.

Re-D. Q. 166. In executing those papers you executed them for the benefit of the Thomson Electric Welding Co. did you not?

A. I did.

Re-D. Q. 167. How are you now related to Thomson Electric Welding Company, or the Thomson Spot Welder Co. or those affiliated with them?

A. The only relation that there is that I occasionally assist them in their engineering department from time to time for which they pay me a certain sum per day plus traveling expenses.

Re-D. Q. 168. You appeared as witness in this case in response to a subpoena issued by the District Court at Providence on the 3rd day of January 1919, did you not?

A. I did.

*Recross-examination by MR. STACKPOLE.*

Re-X. Q. 169. In July 1898 you carried out the method illustrated in defendants exhibit Rietzel sketch and according to your affidavit of February 18, 1909 the circumstances must have been told by you to Townsend & Decker. Between 1898 and 1909 what occasion did you have to tell anyone of your work illustrated by this Rietzel sketch?

A. I didn't have any occasion to tell anyone.

Re-X. Q. 170. Did you do so?

A. I did not.

*Redirect-Examination by MR. STEUART.*



Re-D. Q. 171. Did you tell no one about this 1898 work not even your attorneys at the time your application was prepared nor at the time of the interference with Lachman, nor at the time when you prepared and executed your affidavit of Oct. 23rd, 1908?

A. The only communication was at the time that I did the work in 1898 when I stated that I was quite sure I showed this work to Mr. Clark and Mr. Osgood at or about the time I did it. It might again been brought to the attention of both of the aforesaid gentlemen at the time I welded the LaDow samples. The next communication was to Townsend & Decker and it is possible that I may have communicated to them this information at the time the first affidavit was prepared at any rate I can say that it was not communicated to anybody except to my attorneys Townsend & Decker. I don't remember of having communicated to Townsend & Decker this information at the time the Lachman interference was declared as I don't even recollect just when the Lachman interference was declared or when I learned of it, but it may have been possible that it was communicated to Townsend & Decker at that time. I have no means now of verifying the exact date except by recollection. It must be borne in mind that I had several patents pending in the office and citations and interferences and affidavits and preliminary statements were filed by me that I can not now pick out which ones or definite dates and information as to the various applications given to my attorneys.

Deposition closed signature and certificate waived by consent of counsel.

UNITED STATES DISTRICT COURT.

EASTERN DISTRICT OF MICHIGAN,

SOUTHERN DIVISION

In Equity.

ON HARMATTA PATENT NO. 1,046,066.

THOMSON SPOT WELDER COMPANY, PLAINTIFF.

v/s.

FORD MOTOR COMPANY, DEFENDANT.

STIPULATION.

It is hereby stipulated and agreed by and between counsel for the respective parties hereto that the originals of depositions taken herewith as well as the Exhibits offered in connection therewith,



## Stipulation.

may be delivered to and remain in the custody of the counsel for the party taking and offering the same until the trial or hearing of the cause, subject to inspection and all proper use by opposing counsel upon reasonable notice.

MELVILLE CHURCH,  
*Counsel for Defendant.*  
 J. L. STACKPOLE,  
*Counsel for Plaintiff.*

## UNITED STATES DISTRICT COURT,

EASTERN DISTRICT OF MICHIGAN,

SOUTHERN DIVISION.

IN EQUITY.

THOMSON SPOT WELDER COMPANY. Plaintiff,

vs.

FORD MOTOR COMPANY, Defendant.

ON HARMATTA PATENT No. 1,046,066.

## STIPULATION.

It is hereby stipulated and agreed by and between counsel for the respective parties hereto that the annexed copy of the depositions of the following named witnesses, together with the exhibits offered in connection therewith, heretofore taken and introduced in the several suits pending in the District Court of the United States for the District of Massachusetts entitled respectively, American Electric Welding Company and Thomson Spot Welder Company vs. Houghton & Dutton Company, Equity No. 794, SAME vs. George Borgfeldt & Company, Equity No. 795, SAME vs. S. S. Kresge Company, Equity No. 796, SAME vs. Grand Union Tea Company, Equity No. 797, and SAME vs. Jordon-Marsh Company, Equity No. 790, may be introduced read and used in behalf of the defendant in this cause with the same force and effect as though regularly taken and introduced herein subject to all the objections made and entered at the time of the taking of such depositions, viz:

1. The deposition of John P. Estabrook, of Warren Ohio.
2. The deposition of Pearl M. Long, of Warren, Ohio.
3. " " " George B. Sawyer, of Warren, Ohio.
4. " " " Charles B. McCurdy, of Warren, Ohio.
5. " " " Fred W. Roberts, of Lakewood, Ohio.

6. "Defendant's Exhibit No. 1. 1900 Catalogue of the Warren Electric & Specialty Company."
7. "Defendant's Exhibit No. 2. 1901 Catalogue of the Warren Electric & Specialty Company."
8. "Plaintiff's Exhibit A. Catalogue of the Company for 1903" (marked for identification.)
9. "Plaintiff's Exhibit B. Catalogue of the Company for 1904." (marked for identification.)
10. "Defendant's Exhibit 3. Schedule of Machinery Transferred to Peerless Electric Company July 31, 1902."
11. "Defendants's Exhibit 4. Duplicate Schedule of Machinery sold to the Peerless Electric Company."
12. "Defendant's Exhibits 4, 5, 6, 7 and 8, respectively, Schedules of Property Transferred from the Warren Electric & Specialty Company to the Peerless Electric Company in 1908."
13. "Defendant's Exhibit 9. Transformer Book of the Warren Electric & Specialty Company."
14. "Defendant's Exhibit No. 10. The F. W. Roberts Company, 1900-1901 Ledger."

And it is further stipulated and agreed that the aforesaid Exhibits introduced during the taking of said depositions may be delivered to and remain in the custody of counsel for defendant herein (subject to the right of examination and use by counsel for plaintiff, on due notice) until the trial or hearing of this cause.

J. L. STACKPOLE,  
*Counsel for Plaintiff.*

MELVILLE CHURCH,  
*Counsel for Defendant.*

## DISTRICT COURT OF THE UNITED STATES,

DISTRICT OF MASSACHUSETTS.

AMERICAN ELECTRIC WELDING COMPANY & THOMSON SPOT  
WELDER COMPANY, Plaintiffs,

vs.

HOUGHTON &amp; DUTTON COMPANY, Defendants.

EQUITY.

No. 794

AMERICAN ELECTRIC WELDING COMPANY & THOMSON SPOT  
WELDER COMPANY, Plaintiffs,

vs.

GEORGE BORGFELDT &amp; COMPANY, Defendants

EQUITY.

No. 795.

AMERICAN ELECTRIC WELDING COMPANY & THOMSON SPOT  
WELDER COMPANY, Plaintiffs,

vs.

S. S. KRESGE COMPANY, Defendant.

EQUITY.

No. 796.

AMERICAN ELECTRIC WELDING COMPANY & THOMSON SPOT  
WELDER COMPANY, Plaintiffs,

vs.

GRAND UNION TEA COMPANY, Defendant.

EQUITY.

No. 797.

AMERICAN ELECTRIC WELDING COMPANY & THOMSON SPOT  
WELDER COMPANY, Plaintiffs,

vs.

JORDON-MARSH COMPANY, Defendant.

EQUITY.

No. 790.

Depositions *de bene esse* taken in behalf of the Defendants, pursuant to notice and by agreement and under the Statutes of the United States and Equity rules, at the office of The Peerless Electric Company, in Warren, Trumbull County, State of Ohio, beginning at 1:30 o'clock P. M., September 20, 1917, before George T. Hecklinger, Esq., a duly qualified Notary Public in and for Trumbull County, State of Ohio.

APPEARANCES: ALLEN D. KENYON, Esq., for American Electric Welding Company; J. L. STACKPOLE, Esq., and DANIEL J. LYNE, Esq., for Thomson Spot Welder Company; ROBERT CUSHMAN, Esq., for Houghton & Dutton Company, George Borgfeldt & Company, S. S. Kresge Company and Grand Union Tea Company; and JOHN C. KERR, Esq., for Jordon-Marsh Company.

It is hereby stipulated by and between the parties, by their respective counsel, that these depositions may be taken at one and the same time in and for all of the above entitled causes, and may be entitled in all of said causes, and may be used with the same force and effect as though taken and entitled separately in and for all of said causes.

It is further stipulated that any deposition, which may be taken in behalf of the Plaintiffs, may be similarly taken and entitled in and for all of said causes at one and the same time, in the same manner and with the same effect as hereinbefore stipulated with respect to Defendant's depositions.

IN THE UNITED STATES DISTRICT COURT,

NORTHERN DISTRICT OF OHIO,

EASTERN DIVISION.

THOMSON SPOT WELDER COMPANY, a corporation, Plaintiff,

*v.s.*

THE NATIONAL ELECTRIC WELDER COMPANY, a corporation,  
FRED P. McBERTY, N. A. WOLCOTT, H. C. MILLIGAN, S. S.  
KURTZ, T. H. KANE, R. R. DANGELEISEN, C. R. JAMISON,  
WELDING PATENTS INVESTIGATING COMMITTEE, AND THE  
FEDERAL MACHINE & WELDER COMPANY, a corporation,  
Defendants.

EQUITY.

No. 431.

APPEARANCES: DANIEL J. LYNE, Esq., & J. L. STACKPOLE,  
Esq., for the Plaintiff.

A. S. PATTISON, Esq., for the defendants,  
H. C. Milligan, S. S. Kurtz, T. H. Kane,  
R. B. Dangeleisen, C. R. Jamison, and  
Welding Patents Investigating Committee.

It is stipulated in the above entitled cause that the attached depositions of John B. Estabrook, George B. Sawyer, Pearl M. Long

and Charles Bordman McCurdy, taken today for use in the following Massachusetts cases, namely, American Electric Welding Company & Thomson Spot Welder Company vs. Houghton & Dutton Company, Equity No. 794, American Electric Welding Company & Thomson Spot Welder Company against George Borgfeldt & Company, Equity No. 795, American Electric Welding Company & Thomson Spot Welder Company vs. S. S. Kresge Company, Equity No. 796; American Electric Welding Company & Thomson Spot Welder Company vs. Grand Union Tea Company, Equity No. 797; and American Electric Welding Company & Thomson Spot Welder Company vs. Jordon-Marsh Company, Equity No. 790, may be offered in evidence with the same force and effect as though taken for use in this action.

The Plaintiff contends that there was no right to take these depositions in said action, and objects to their taking, and reserves the right to present this objection at the proper time, and to move, if necessary, that they be stricken from the files.

.....  
*Attorney for Plaintiff.*

.....  
*Attorney for above Defendants.*

JOHN B. ESTABROOK, a witness called by and on behalf of the defendants, having been duly sworn on oath, deposes and says:

*Direct Examination by MR. CUSHMAN:*

Question. What is your full name?

Answer. John B. Estabrook.

Q. Where do you live?

A. Warren, Ohio.

Q. What is your occupation?

A. Sales Manager and Secretary of The Peerless Electric Company.

Q. How long have you been connected with The Peerless Electric Company in any capacity?

A. Since its organization.

Q. When was it organized?

A. According to the record book it was during the summer of 1902.

Q. Are you one of the original stockholders in The Peerless Electric Company?

A. Yes, sir.

Q. What is the business of The Peerless Electric Company?

A. The manufacture of fan motors and power motors and electrical apparatus.

Q. And did the Company begin business as soon as it was organized?

A. So far as I know, yes, sir.

Q. Were you connected with The Warren Electric & Specialty Company?

A. Yes, sir.

Q. Where was their factory at and prior to the time The Peerless Electric Company was organized?

A. You mean at Warren, Ohio?

Q. Yes.

A. Practically on this same ground. The factory is right adjacent to this office.

Q. Is the factory still there?

A. Not there, no, sir. Part of it is a little further down the street, moved across the street.

Q. You mean the building has been moved?

A. Yes.

Q. Is The Warren Electric & Specialty Company out of business?

A. Yes, sir.

Q. What was the business of The Warren Electric & Specialty Company?

A. They manufactured incandescent lamps, fan motors and transformers.

Q. Did they style the product of their fan business under any trade mark or trade name?

A. Yes, sir. Originally "W. E. & S. CO." Later "Peerless".

Q. Did The Warren Electric & Specialty Company sell out its fan business to The Peerless Electric Company?

A. Yes, sir.

Q. Can you tell me when that was?

A. According to the records it was in the summer of 1902.

Q. In whose custody are the records and documents of The Peerless Electric Company?

A. The minute book only is in my custody. The balance of the books are in the custody of the Treasurer.

Q. What is the Treasurer's name?

A. W. C. Ward.

Q. Of this city?

A. Yes, sir.

Q. Are you familiar with the account books and other documentary matters of The Peerless Electric Company in your capacity as Secretary?

A. No, sir, I am not in the book-keeping department at all.

Q. I mean do you know what the books consist of, what they are; are you able to recognize and identify them?

A. You mean the book-keeping books?

Q. I mean the ledger and documents that belong to the archives of The Peerless Electric Company.

A. I cannot do that, no sir.

Q. Can you produce the minutes of the Stockholders' and Directors' meetings of The Peerless Electric Company?

A. Yes, sir.

Q. Will you kindly do so?

(Witness hands book to Mr. Cushman entitled "RECORD OF THE PEERLESS ELECTRIC COMPANY.")

Q. Does this book contain the records of The Peerless Electric Company from the beginning of its incorporation?

A. So far as I know. I have only been secretary for seven years.

Q. Who was your predecessor in that office?

A. E. W. Gillmer

Q. Was he one of the original stockholders and organizers of this Peerless Electric Company?

A. Yes, sir.

Q. Is he living?

A. No, sir.

Q. Did this book (referring to the minute book of The Peerless Electric Company which the witness handed to Mr. Cushman) come into your custody as successor of Mr. Gillmer, the former secretary?

A. Yes, sir.

It is stipulated that the book entitled "RECORD OF THE PEERLESS ELECTRIC COMPANY" may be left in the possession of The Peerless Electric Company without introducing it in evidence and that in lieu thereof the following transcript may be used with the same force and effect as the original book.

The following are the records referred to:

"The incorporators of The Peerless Electric Company hereby waive the giving of notice of opening books for subscription to the capital stock of said corporation. Warren, Ohio, June 12, 1902.

(Signed) T. H. GILLMER  
ELMER W. GILLMER  
E. E. NASH  
W. C. WARD  
JACOB PERKINS  
JAMES W. HOLLOWAY  
WILLIAM WALLACE"

"Warren, Ohio, June 1902.

"We hereby severally subscribe to the capital stock of The Peerless Electric Company the number of shares written opposite our respective names, and agree to pay therefor the sum of \$ per share.

<i>Names</i>	<i>Shares</i>
T. H. Gillmer	420
Elmer W. Gillmer	660
E. E. Nash	120
W. C. Ward	52
Jacob Perkins	70
James H. Holloway	150
William Wallace	90"

# "WAIVER OF NOTICE OF STOCKHOLDERS MEETING"

Warren, Ohio, June 20, 1902.

"The undersigned, being all the subscribers to the capital stock of The Peerless Electric Company, and being all personally present, as below subscribed at the first stockholders' meeting, hereby waive the giving of notice of meeting for the purpose of electing Directors as provided by law.

Names	Shares
T. H. Gillmer	420
Elmer W. Gillmer	660
	120
	51
Jacob Perkins	70
James W. Holloway	150
William Wallace	90"

## "FIRST STOCKHOLDERS' MEETING"

"In accordance with the waiver of notice of the time and place of holding a meeting for the purpose of electing Directors of The Peerless Electric Company, as shown on page 11 of this book, the said stockholders of said Company met at the office of T. H. Gillmer, 49 E. Market Street, Warren, Ohio, at 7 o'clock P.M. June 20, 1902. All the stockholders being present, either personally or by proxy as follows:

	Shares
T. H. Gillmer	420
Jacob Perkins	70
William Wallace	90
W. C. Ward	51
E. W. Gillmer	660
James W. Holloway	150
E. E. Nash (proxy)	120

"On motion it was resolved that the Board of Directors of The Peerless Electric Company be composed of seven persons.

"An election for Directors was then held by ballot, which resulted as follows:

"T. H. Gillmer, Elmer W. Gillmer, Jacob Perkins, William Wallace, W. C. Ward, E. E. Nash and James W. Holloway each received 1561 votes; and said persons were duly declared elected as Directors by Jacob Perkins and W. C. Ward, who acted as inspectors of election.

"Said inspectors appointed the first meeting of the Directors to be at the office of T. H. Gillmer, 49 E. Market Street, Warren, Ohio, at 8 o'clock P.M., June 20, 1902.

"On motion stockholders meeting adjourned.

(Signed) T. H. GILLMER,  
Chairman Secretary."



"State of Ohio, Trumbull County, ss.:

"Before me personally came T. H. Gillmer, Elmer W. Gillmer, Jacob Perkins, E. E. Nash, J. W. Holloway, W. C. Ward and William Wallace, directors of The Peerless Electric Company, who, being first duly sworn severally, say that they will faithfully discharge the duties of directors of said Company to the best of their ability.

(Signed) T. H. GILMER  
JACOB PERKINS  
W. C. WARD  
JAMES W. HOLLOWAY  
WILLIAM WALLACE  
ELMER W. GILLMER,  
E. E. NASH.

"Signed in my presence and sworn to before me this 20th day of June, 1902.

(Signed) E. E. ROBERTS,  
(Notary Seal) *Notary Public.*"

"Warren, Ohio, June 20, 1902.

"Pursuant to notice given by inspectors of election at stockholders' meeting of The Peerless Electric Company held June 20, 1902 at 7 o'clock P.M. the directors of said Company met at the office of T. H. Gillmer, 49 E. Market Street, June 20, 1902, at 8 P. M., and the oath faithfully to discharge the duties of director of said Company having been administered by E. E. Roberts, Notary Public, to all except E. E. Nash, who was absent, Mr. William Wallace was chosen chairman, and T. H. Gillmer secretary.

"On motion of T. H. Gillmer, the officers of said Board of Directors consist of President, Vice President, Secretary and Treasurer, the said Secretary & Treasurer to be one person.

"Motion carried.

"An election was then held for President; and T. H. Gillmer was declared President.

"W. C. Ward was declared Vice President, and Elmer W. Gillmer was declared elected Secretary and Treasurer.

"On motion it was resolved to call 50 per cent of capital stock on or before August 10th.

"On motion the president was directed to prepare and submit rules for conducting the meetings of the Company, and by-laws for company.

"On motion, meeting adjourned.

(Signed) T. H. GILLMER, *Secretary.*"

"Warren, Ohio, June 23, 1902.

"An adjourned meeting of the Directors of The Peerless Electric Company was held at the office of T. H. Gillmer on

Monday evening, June 23. It was discussed as to whether a general manager should be elected; but for the present it was decided not to have this office.

"The prospects of the business was thoroughly discussed, and the Secretary was authorized to build a new building which would contain Japanning Oven, Plating Department, Buffing Rooms, etc. This building was to be one story and a basement high for the present, and located on the rear of the property west of the "Economy" building, in such a position it would not interfere with the proposed extensions, pencil drawings of which were submitted.

"It was unanimously decided to purchase the Economy Company real estate at \$5500.00, the house and lot west of it from E. W. Gillmer at cost, which amounted to \$768.00, and from The Warren Electric & Specialty Company all of their real estate west of the driveway, 15 feet wide, which lies at the west of their present plant. This last named property contains several buildings, and all of these buildings, together with real estate, it was decided to purchase at their value to be determined upon mutually between the Directors of the two Companies. It was also decided to offer The Warren Electric & Specialty Company \$30,000.00 for the good will, patents and the copyrighted name "Peerless," as applying to everything else which their copyright covered except incandescent lamps.

"It was also decided to purchase their patterns, machinery, furniture and fixtures and the finished and unfinished product of the fan and transformer departments, the machinery and furniture and fixtures alluded to are all of the machinery, tools, fixtures and implements used in the manufacture of fans, transformers and motors, and in fact all of the business of The Warren Electric & Specialty Company, together with the appliances of manufacture, except that portion devoted to the manufacture of incandescent lamps. The matter of assessment on the capital stock was talked over but was not decided, but left open until such time as would be determined what amount would be necessary to complete the purchase of the above mentioned, and also to give a sufficient amount of working capital.

"On motion of J. W. Holloway, seconded by E. W. Gillmer, the meeting was adjourned subject to the call of the President.

"Those present were T. H. Gillmer, William Wallace, Jacob Perkins, W. C. Ward, J. W. Holloway and E. W. Gillmer. E. E. Nash being absent."

"Warren, Ohio, June 20, 1902.

"We, the undersigned, do hereby agree to pay for the number of shares of The Peerless Electric Company set opposite our names at par, and to pay for same upon call of assessments by the directors of the Company.

<i>NAMES</i>	<i>SHARES</i>
E. E. Roberts	10 shares
E. E. Nash	120 "
Pearl Long	20 "
Fred P. McBerty	15 "
George B. Sawyer	15 "
J. W. Powers	15 "
J. W. Holloway	150 "
W. C. Ward	51 "
T. H. Gillmer	330 "
Jacob Perkins	100 "
William Wallace	80 "
J. W. Holloway	200 "
P. L. Webb	200 "
Richard Sibson	60 "
Elmer W. Gillmer	1789 "

"Warren, Ohio, August 8, 1902.

"At a meeting of the Directors of The Peerless Electric Company, held at the office of The Warren Electric & Specialty Company on Friday, August 8, it was decided to complete the purchase from The W. E. & S. Co. of their real estate above their present building where their offices are located. The amount to be paid was as per inventory \$14,745.17, and to pay E. W. Gillmer \$768.00 for the house and lot west of the Economy building, and to pay The Economy Company \$5,500.00 for their real estate and buildings, and to purchase of The W. E. & S. Co. machinery amounting to \$8661.67, furniture and fixtures \$2002.90, patterns \$3475.00, transformers and transformer material \$12,123.81, fan motor and fan motor material \$20,500.37, the shopright to make electrolier ceiling fans \$500.00, and \$30,000.00 for the good will of the fan and transformer business and for the use of the copy-righted trade mark "Peerless," as applied to every thing which it covers, except incandescent lamps. In order to do this an assessment of 50 per cent on the capital stock was made and declared payable at once. It was unanimously decided to place insurance amounting to One Thousand Dollars each on the brick buildings, and to place insurance to the amount of 20 per cent of the value on the contents in the warehouses, and not to place any insurance on the contents of the office building, but to place 80 per cent insurance of the value on the wooden building and its contents.

"The Secretary was unanimously instructed to complete the buildings now under way and to equip them with furniture and machinery, and to purchase material, and to get the company organized under way at the earliest possible moment. He was also instructed to divide the salaries of employees working for both companies in an equitable way. A discussion was held

in regard to water-rights, and it was decided to drill some wells, and a determination as to the future water supply would be reached upon their completion.

"Those present were T. H. Gillmer, Elmer W. Gillmer, E. E. Nash, J. W. Holloway, W. C. Ward and William Wallace. Mr. Perkins being absent.

"Meeting adjourned."

"At a directors' meeting held at the office of the Company on West Market Street on Monday afternoon, October 13 at 4 P.M., it was unanimously decided to purchase 4 boilers and engine, a belt, and some shafting from Virginia parties. Machinery that had been used in The Griswold Linseed Oil Mill for \$4,100. It was also decided to install them in the new brick power house at once, and to engage in the manufacture of power motors on a large scale, and to erect large and commodious brick buildings at once, or if not possible to get them built this fall to at least get the foundations in. It was also decided to accept Mr. Thornton's proposition to come as draftsman for three months at \$100.00 per month, with an advance afterwards, if he proved satisfactory. And to make an arrangement with F. P. McBerty for one year from November 1st at the rate of \$1750.00 per year. And to do this it was decided to assess all stock at present subscribed, namely \$225,000.00 par value, 10 per cent more, making 60 per cent, and to sell the balance, \$275,000.00, at 60 cents on the dollar, with the understanding that it was not to be further assessed.

"Present T. H. Gillmer, E. W. Gillmer, William Wallace, J. W. Holloway, Jacob Perkins.

"All of the above was informally done, but all agreed.

"On motion J. W. Holloway, seconded by E. W. Gillmer, meeting adjourned at 6 P. M."

Q. Mr. Estabrook, upon the transfer of the fan and transformer business from The Warren Electric & Specialty Company to The Peerless Electric Company did The Peerless Electric Company begin the manufacture of "Peerless" electric fans?

A. Yes, sir.

Q. Does The Peerless Electric Company still make "Peerless" electric fans?

A. Yes, sir.

Q. Do they make anything else?

A. Motors and generators, and special electric apparatus.

Q. I show you two catalogues, purporting to be catalogues of The Warren Electric & Specialty Company, relating to "Peerless" fans, do you recognize them?

A. Yes, sir.

Q. What are they?

A. They are catalogues which were turned over to The Peer-

less Electric Company when they bought out The Warren Electric & Specialty Company.

Q. Were you familiar with the advertising matter of The Warren Electric & Specialty Company previous to the transfer of the fan business to The Peerless Electric Company?

A. To some extent, yes, sir.

Q. Can you tell us whether or not catalogues like these two catalogues before you were published by The Warren Electric & Specialty Company previous to that transfer?

A. They were, sir.

Q. In what year was this catalogue, which I show you (handing witness catalogue) published?

A. 1900.

(Mr. Cushman: The catalogue, referred to by the witness, is introduced in evidence and marked "DEFENDANTS EXHIBIT NO. 1, 1900 CATALOGUE OF THE WARREN ELECTRIC & SPECIALTY COMPANY.")

Q. Will you look at the other Warren Electric & Specialty Company's catalogue and tell us in what year that was published?

A. 1901.

(Mr. Cushman: The catalogue, referred to by the witness, is offered in evidence and marked DEFENDANTS' EXHIBIT 2, 1901 CATALOGUE OF THE WARREN ELECTRIC & SPECIALTY COMPANY.")

Q. Upon the purchase of the electric fan and transformer business from The Warren Electric & Specialty Company in the summer of 1902, what was done with the machinery, fixtures, materials and parts in process, and other things pertaining to the fan and transformer business of The Warren Electric & Specialty Company?

A. I lived in Ravenna at that time, and I cannot answer you in detail as to that.

Q. How far away is Ravenna?

A. Twenty-four (24) miles.

Q. Did you come to Warren frequently during that time?

A. Yes, sir.

Q. Somewhere about that time were the things, referred to, moved from the factory of The Warren Electric & Specialty Company?

A. As I remember it, as soon as the large building was completed the machine shop and machinery was all moved from the Economy building over into the big new brick building.

Q. Before that was all moved from the Warren Electric & Specialty Company's factory into the Economy building?

A. I can't tell you that.

Q. Well, you knew it got into the Economy building, didn't you?

A. Yes, they ran the machine shop in the Economy building for quite a little while.

Q. For the manufacture of fans?

A. Yes, sir.

Q. And later moved the fan equipment from the Economy building into the new building?

A. Yes, sir.

Q. When did you return from Ravenna?

A. 1905 I believe, sir.

Q. Will you look at these papers I now show you, and tell us what they are?

A. From the description and heading, they are lists of equipment, furniture, fixtures, machinery, etc., that the Warren Electric & Specialty Company sold to The Peerless Electric Company.

Q. Are these documents, which you have produced here, out of the records of The Peerless Electric Company?

A. Mr. Hoffman got these from the vault.

Q. Who is Mr. Hoffman?

A. He is manager of the Production Department of The Peerless Electric Company.

Q. Do these papers constitute part of the records of The Peerless Electric Company as you know them in your capacity as Secretary of that corporation?

A. Why, I take it they are. I have never seen them before that I know of. I cannot recognize them as Secretary of the Company.

Direct examination closed.

(Mr. Stackpole: Counsel for Plaintiff objects to the entire Direct Examination of this witness as incompetent, immaterial and irrelevant, and to Defendants' Exhibits 1 and 2 as immaterial, irrelevant and not proved.)

(It is agreed that these objections are seasonably taken.)

*Cross-examination* by MR. STACKPOLE, Counsel for Thomson Spot Welder Company (without waiving objections).

Q. Were you employed by The Warren Electric & Specialty Company?

A. Yes.

Q. In what capacity?

A. I simply was in different capacities in the factory.

Q. In what years?

A. From 1894 to 1899.

Q. What part of the year does the fan season begin?

A. We contract for them about the first three months in the year, and ordinarily commence shipping about the first of March.

Q. What personally did you have to do with getting out Defendants' Exhibit 1?

A. I gave it to Mr. McBerty.

Q. What do you mean by that?

A. Handed it to him.

Q. When?

A. I think about three or four months ago.

Q. I don't mean getting it out in that sense. What did you personally have to do with its preparation at the time it was made up?

A. Nothing, sir.

Q. Did you have anything to do with its distribution?

A. No, sir.

Q. Did you have anything to do with getting up Defendants' Exhibit 2, at the time it was gotten up?

A. No, sir.

Q. Or its distribution?

A. No, sir.

Q. When did you first see Defendants' Exhibit 1?

A. Both here and at Ravenna, the years they were issued.

Q. By whom were you employed during these years?

A. Colonial Electric Company.

Q. Where was that located?

A. Ravenna.

Q. When did you first see Defendants' Exhibit 2?

A. The year it was published.

Q. How do you fix that date?

A. From the fact I was back and forth all the time, and I sold some of these fans from Ravenna.

Q. You have referred to January, February and March as the season when the contracts are made for the fans of a certain year. What contracts do you mean?

A. Contracts with the jobbers and our customers to whom we sell the fans.

Q. And the catalogues were prepared for making those contracts and selling the fans?

A. Yes, sir.

Q. Have you ever seen a 1902 catalogue of The Warren Electric & Specialty Company relating to fans?

A. I can't answer that, I cannot tell you.

Q. Why are you uncertain about this?

A. I cannot tell whether the 1902 were put out in the name of The Warren Electric & Specialty Company or The Peerless Electric Company.

Q. Have you got a 1902 catalogue of either The Warren Company or The Peerless Company?

A. I will have to look that up and see if I can find one. I cannot tell you without looking.

Q. Did The Peerless Company get out a catalogue for its fans in 1903?

A. Yes, sir.

Q. Did they get out catalogues for their fans in subsequent years up to 1906?

A. Yes, sir.

Q. You think you could find samples of these catalogues?

A. I would be glad to try.

Q. I would be glad to have you produce, if you can, the catalogue of either The Warren Company or The Peerless Company for 1902, and the catalogues of The Peerless Company from that time on to 1906, if you can do so.

A. Right away?

Q. How long would it take you to look?

A. I don't think over ten minutes.

Q. Will you please make a search?

(Witness leaves the room to make search.)

(Witness returns to room in which this hearing is being held.)

Q. Have you made search?

A. Yes, sir.

Q. Did you find a catalogue of either The Warren Company or The Peerless Company of 1902?

A. I did not.

Q. You found catalogues of The Peerless Company for 1903 and 1904?

A. Yes, sir.

Q. Are you willing to loan these catalogues to us during the pendency of this suit, leaving them in the custody of the examiner in the Court?

A. Yes, sir.

(The two catalogues from The Peerless Electric Company, of 1903 and 1904, are marked by the Notary for identification as "PLAINTIFFS' EXHIBIT A, CATALOGUE OF THE COMPANY FOR 1903", and "PLAINTIFFS' EXHIBIT B, CATALOGUE OF THE COMPANY FOR 1904".)

(Mr. Chushman: Counsel for Defendants objects to the use of these catalogues, or any examination in relation



thereto, on the ground that they are immaterial, and that they are not cross-examination in reply to any matters inquired of on Direct Examination.)

Q. Did you also find an advertisement of The Warren Electric & Specialty Company of a fan, which advertisement is dated March, 1902, in "The American Electrician"?

A. Yes, sir.

Q. On pages 46 and 47 of said "American Electrician" for March, 1902?

A. Yes.

Q. From where did you obtain "Defendants' Exhibits 1 and 2"?

A. From the scrap-book in which we keep all advertising material.

Q. Was it from that same scrap-book that you obtained the Peerless catalogues for 1903 and 1904?

A. Yes, sir.

Q. Did you find in that scrap-book any catalogue of either The Warren Company or The Peerless Company for 1902?

A. No, sir, I did not.

Q. I notice that "DEFENDANTS' EXHIBIT 1", before it was offered in evidence today, had on it in ink the following: "WARREN ELECTRIC & SPECIALTY COMPANY 1900 CATALOGUE, GEORGE T. HECKLINGER, NOTARY PUBLIC". Do you know why this writing appears on this catalogue?

A. No, sir.

Q. On Defendants' Exhibit 2 appears in ink: "Warren Electric & Specialty Company 1901 catalogue, Exhibit A, George T. Hecklinger, Notary Public". Do you know why this writing appears on this catalogue?

A. No, sir.

Q. Did you have anything to do with putting this writing on these two exhibits?

A. No, sir.

Q. Do you know what this writing indicates?

A. No, sir.

Q. In looking through your scrap-book of catalogues and advertisements I notice a page with what appears to be the outside cover of a catalogue pasted to it, and the rest of the catalogue has been removed. This page follows one containing an advertisement dated September, 1901, and precedes another page containing an advertisement on which is written "December 27, 1902", and another page on which is an advertisement marked "January 1902". Can you tell me if the catalogue, which seems to have been torn out, was the 1902 catalogue of either The Peerless Company or The Warren Company?

A. I cannot say definitely.

Q. What do you think?

A. I think it was.

Q. Of which Company?

A. I cannot say definitely, sir.

(Mr. Stackpole: In view of the testimony of the witness on Cross-Examination, the objection to his testimony on direct is renewed; and the Plaintiffs' reserve the right, at a certain time, to move for the cancellation of his deposition and the exclusion of the exhibits offered by the defendants.)

Cross-examination closed.

*Re-direct examination* by Mr. CUSHMAN:

Re-D. Q. While you were working for the Colonial Electric Company at Ravenna did you sell fans of the manufacture of the Warren Electric & Specialty Company before they sold their business to the Peerless Company?

A. Yes, sir.

(Mr. Cushman: That is all).

Re-direct examination of witness closed.

(Signed)

JOHN B. ESTABROOK.

Attest:

(Signed) GEO. T. KECKLINGER,

*Notary Public.*

Notarial Seal.

PEARL M. LONG.

PEARL M. LONG, a witness called by and on behalf of the defendants, having been duly sworn on oath, deposes and says:

*Direct Examination* by Mr. CUSHMAN.

Question. What is your name?

Answer. Pearl M. Long.

Q. You live in Warren?

A. Yes, sir.

Q. By whom are you employed?

A. By The Peerless Electric Company.

Q. In what capacity?

A. That of book-keeper.

Q. Were you ever in the employ of The Warren Electric & Specialty Company?

A. Yes.

Q. When was that?

A. In the fall of 1899.

Q. How long did you continue with The Warren Electric & Specialty Company?

A. Only a short time. I cannot recall just how long.

Q. Were you with them until they sold out the fan business to The Peerless Electric Company?

A. No.

Q. By whom were you employed in between?

A. By The Economy Electric Company.

Q. How long were you employed by The Economy Electric Co.?

A. I would say about a year.

Q. When did you go to work for The Peerless Electric Company?

A. At the time they were organized in 1902.

Q. Were you employed by them as book-keeper?

A. Yes, sir.

Q. I show you a book entitled "Sales Ledger No. 1, Peerless Electric Company." Do you know what that book is?

A. Yes, sir.

Q. What is it?

A. That is the original first sales ledger of The Peerless Electric Company.

Q. By whom was this book kept?

A. I kept it.

Q. Will you refer to some of the early entries and tell us the dates of the first sales of electric fans by The Peerless Electric Company?

A. Do you want the very first sale?

Q. Yes, the earliest sale.

A. August 11, 1902.

Q. To whom were some sales made August 11, 1902?

A. Illinois Electric Company, of Chicago, Illinois. I find another sale under date of August 30, 1902, to The W. G. Nagle Electric Company of Toledo, Ohio.

Q. Then the earliest sale of an electric fan completed by The Peerless Electric Company was August 11, 1902, was it?

A. Yes.

Q. Were there sales of fan parts and supplies around that date also?

A. Yes.

Q. Point out one or two early sales of that kind.

A. On August 11, 1902, there were sales of parts made to The Electric Supply & Engineering Company of Detroit, Michigan. Also on the same date to Stanley & Patterson Company of New York City.

Q. From that time did The Peerless Electric Company engage continuously in making and selling so-called "PEERLESS FANS?"

A. Yes, sir.

Q. Where was the factory of The Warren Electric & Specialty Company before they sold out their fan business?

A. In the wooden building just east of this Peerless office building.

Q. Is that building there now?

A. No, it has been removed.

Q. Did The Warren Electric & Specialty Company go out of business?

A. They sold out.

Q. After The Warren Electric & Specialty Company sold out the fan business to The Peerless Company, do you recall where the machinery and fixtures, and parts, etc., were moved?

A. No, I do not recall that.

(It is stipulated that in lieu of introducing the ledger referred to by the witness, the entries testified to by this witness may be used with the same force and effect as though the book itself were introduced in evidence.)

Direct examination closed.

(Mr. Stackpole: The deposition of this witness is objected to as being immaterial and irrelevant. And it is agreed that this objection is seasonably taken.)

(Mr. Stackpole: No cross-examination.)

Examination of witness closed.

(Signed)

PEARL M. LONG.

Attest:—

(Signed) GEO. T. HECKLINGER,  
*Notary Public.*

Notarial Seal.

GEORGE B. SAWYER.

GEORGE B. SAWYER, a witness called by and on behalf of the defendants, having been duly sworn on oath, deposes and says:

*Direct examination by Mr. CUSHMAN:*

Question. What is your full name?

Answer. George B. Sawyer.

Q. You live in Warren, Ohio?

A. Yes, sir.

Q. What is your occupation?

A. At the present time I am employed in the purchasing department of The Peerless Electric Company.

Q. How long have you been in the employ of The Peerless Electric Company?

A. Well, ever since the Company was organized, which was about 15 years ago, or a little better.

Q. By whom were you employed before that?

A. Warren Electric & Specialty Company.

Q. How long were you in the employ of The Warren Electric & Specialty Company?

A. About three years.

Q. And did you go directly from the employ of The Warren Electric & Specialty Company to The Peerless Electric Company at the time The Warren Electric & Specialty Company sold out the fan business to The Peerless Electric Company?

A. Yes, sir.

Q. I show you two catalogues, marked "Defendants' Exhibit 1" and "Defendants' Exhibit 2." Do you recognize them?

A. Yes, sir.

Q. What are they?

A. They are catalogues representing the fan types manufactured by The Peerless Electric Company.

Q. Do you mean manufactured by The Peerless Electric Company?

A. Manufactured by The Warren Electric & Specialty Company, known as "PEERLESS FAN."

Q. When was The Warren Electric & Specialty Company's catalogue, Exhibit 1, published?

A. It is a catalogue representing the 1900 product. The catalogue was probably published in 1899. We got those catalogues out in the winter, probably in December.

Q. When was The Warren Electric & Specialty Company's catalogue, Exhibit 2, published?

A. The catalogue itself was undoubtedly published and printed in 1900, along in December probably.

Q. Did you have anything to do with making up the inventory of properties taken over by The Peerless Electric Company from The Warren Electric & Specialty Company in the summer of 1902?

A. I had something to do with the inventory. Possibly not in making up the schedules or listing the property, but more particularly in pricing these schedules after the property had been listed.

Q. I show you some papers, containing lists of properties, and ask you what they are, this whole bunch (indicating several sheets of paper writing)?

A. Well, those schedules and lists show machinery and tools, furniture and fixtures and raw material of various kinds, and finished product purchased by The Peerless Electric Company from The Warren Electric & Specialty Company.

Q. Referring to the document entitled at the top "Warren Electric & Specialty Company, machinery transferred to The Peerless Electric Company July 31, 1902," and the date "1902," in whose handwriting are the parts I have quoted?

A. The written part "Warren Electric & Specialty Company, machinery transferred to The Peerless Electric Company, July 31, '02" I would say was in the handwriting of Mr. E. W. Gillmer. The date "1902" is in my handwriting.

Q. Were those words written there on the dates named?

A. I would suppose that they were.

Q. Is Mr. Gillmer living?

A. He is dead.

Q. In whose handwriting is the body of the schedule of the document referred to? And if it is in the handwriting of more than one person, please tell us whose hands appear in it.

A. I think the body of this schedule, being the one bearing date 1902, is in the handwriting of Miss Dunbar.

Q. Is she living?

A. She is not living. The figures, or prices, on the margin are in my handwriting; and part of the body on page 7 of the schedule is in my handwriting; also a part of the last two pages of the schedule.

Q. Were the parts, which are in your handwriting, made at the time this schedule is dated?

A. They were.

Q. Can you identify in this schedule "a welding machine" as one of the items taken over by The Peerless Electric Company from The Warren Electric & Specialty Co.?

A. The welding machine is listed on page 8th of the schedule, and is the 10th item "one welding machine."

Q. Did you place check marks opposite the item "one welding machine"?

A. I did.

Q. At the time of the transfer from The Warren Electric & Specialty Company to The Peerless Electric Company in 1902, did The Warren Electric & Specialty Company possess more than one welding machine?

A. Not to my knowledge. There was only one in use around the plant, and that was the particular machine mentioned in the schedule.

(Mr. Cushman: The schedule identified by the witness is offered in evidence, and marked "DEFENDANTS' EXHIBIT 3, SCHEDULE OF MACHINERY TRANSFERRED TO PEERLESS ELECTRIC COMPANY JULY 31, 1902.")

Q. I show you another document, which appears to be a type-written duplicate of the schedule shown in Exhibit 3, is this merely a duplicate of the same schedule, so far as you know?

A. I think it is. I am satisfied it is.

Q. And was this made at the same time (referring to the duplicate)?

A. Approximately the same time.

Q. I notice at the head of this duplicate schedule, a bill head of The Warren Electric & Specialty Company, with the words "Sold to The Peerless Electric Company, Warren, Ohio." In whose handwriting are those latter words?

A. "Peerless Electric Company, Warren, Ohio" is in my handwriting.

(Mr. Cushman: I offer the duplicate schedule in evidence, marked "DEFENDANTS' EXHIBIT 4. DUPLICATE SCHEDULE OF MACHINERY SOLD TO THE PEERLESS ELECTRIC COMPANY.")

Q. I also show you four other schedules, marked DEFENDANT'S EXHIBITS 5, 6, 7 and 8," and ask you what those are respectively?

A. Exhibit 5 represents tools and shop fixtures and office furniture and fixtures. Exhibit 6 is a typewritten copy of Exhibit 5. Exhibit 7 is a listing of material used in the construction of transformers, and also included a list of finished transformers partly finished transformers. Exhibit 8 is, in the main, a listing of material used in the manufacture of "Peerless fans," and also includes a listing of fan parts.

Q. In whose handwriting are the words at the beginning of Exhibit 5: "W. E. & S. Co. F & F transferred to Peerless 7-31-02," and below "1902"?

A. The words "W. E. & S. Co. F & F transferred to Peerless 7-31-02" are in the handwriting of E. W. Gillmer, to the best of my knowledge. The date, written in ink, "1902," is in my handwriting.

Q. In whose handwriting is the body of this schedule, Exhibit 5?

A. To the best of my knowledge it is the writing of Miss Dunbar. Next to the last page of the schedule are a number of items in my handwriting. Part of the price extensions are in my handwriting and partly in the handwriting of Miss Dunbar.

Q. In whose handwriting is the written part of Exhibit 6?

A. The handwritten part of the schedule referred to is in my handwriting.

Q. In whose handwriting is the handwritten part of Exhibit 7?

A. That is also in my handwriting.

Q. In whose handwriting is the handwritten part of Exhibit 8?

A. That is also in my handwriting.

Q. Were these schedules, Exhibits 3 to 8 inclusive, all made out at about the same time?

A. Yes, sir.

Q. And was that time the time that they were dated, namely, in July 1902?

A. Yes, sir.

Q. And was the property listed in these schedules transferred from The Warren Electric & Specialty Company's plant to The Peerless Company's plant at that time?

A. Yes, sir. Let me qualify that. I will say, either shortly before or shortly after.

Q. Was the physical transfer of these articles made at about the time, shortly before or shortly after, and within a matter of a few days, or a longer period?

A. A matter of a few days.

(Mr. Cushman: The schedules, referred to as Exhibits 4, 5, 6, 7 and 8, are introduced in evidence as "DEFENDANTS' EXHIBITS 4, 5, 6, 7 and 8 respectively, SCHEDULES OF PROPERTY TRANSFERRED FROM THE WARREN ELECTRIC & SPECIALTY COMPANY TO THE PEERLESS ELECTRIC COMPANY IN 1902.")

Q. Was the machinery and other property, listed in these schedules, Exhibits 3 to 8, inclusive, transferred at the time of the sale from The Warren Electric & Specialty Company's building to the so-called "Economy Building" owned by The Peerless Company?

A. Yes, sir.

Direct examination closed.

(Mr. Kenyon: I will now cross-examine the witness, without waiving any objections heretofore made.)

*Cross-examination by MR. KENYON.*

Q. I notice the last item in Defendants' Exhibit 5 reads as follows: "100 fan catalogues \$3.00." What were those?

A. I take it they were fan catalogues of The Warren Electric & Specialty Company, showing different types of fans manufactured by them.

Q. What issue of catalogue?

A. I would suppose that was the 1901 catalogue.

Q. I notice a charge is made for these. That shows, I suppose, that these catalogues were ones that they were then using?

A. Undoubtedly.

Q. What was the last fan catalogue they had gotten out prior to August 1902?

A. 1901.

Q. You mean the one published in 1901 for the season of 1902?

A. The one published for the season of 1901.

Q. When was that gotten out?

A. That was undoubtedly printed possibly in December 1900.

Q. Was it the custom of The Warren Company to get out a catalogue each year?

A. Each year that they manufactured fans. The Warren Electric & Specialty Company did not always manufacture fans.

Q. Did they manufacture fans in 1902?



A. Yes.

Q. Did they get out a catalogue for 1902?

A. I suppose they did.

Q. That would be the regular course of business, would it not?

A. Yes.

Q. And that would be the fan that is referred to in these items?

A. Yes, that catalogue listed in this schedule must have been the catalogue representing the 1902 product.

Q. Published about December 1901?

A. Yes, I would suppose so. I crossed myself in my first statement as to when that catalogue was published. I take it for granted that is the case, because the 1902 catalogue is represented in this schedule, and was printed in 1901 in December.

(Mr. Kenyon: That is all.)

Cross-examination of witness closed.

(Signed) GEO. B. SAWYER.

ATTEST:

(Signed) GEO. T. HECKLINGER

(Notarial Seal) *Notary Public*

CHARLES B. MCCURDY.

CHARLES B. MCCURDY, a witness called by and on behalf of the Defendants, having been duly sworn on oath, deposes and says:

*Direct-examination* by MR. CUSHMAN.

Question. What is your full name?

Answer. Charles B. McCurdy.

Q. Where do you live?

A. 323 Mahoning Avenue, Warren, Ohio.

Q. What is your occupation at the present time?

A. Secretary & Treasurer of The Enterprise Electric Company.

Q. Of Warren, Ohio?

A. Of Warren, Ohio.

Q. What is the business of The Enterprise Electric Company?

A. Transformer manufacturers.

Q. Were you ever employed by The Warren Electric & Specialty Company of Warren, Ohio?

A. Yes.

Q. When?

A. I was there from 1899 to 1905. From the first of the year in 1899 until about the first of September, 1905.

Q. Was there a change of business from The Warren Electric & Specialty Company to The Peerless Electric Company during that time?

A. Yes.

Q. When was that?

A. I can't say just when that change was made.

Q. But whenever it was made you continued with that same business and were then employed by The Peerless Electric Company?

A. Yes.

Q. What were your duties with The Warren Electric & Specialty Company before it was transferred.

A. I had charge of the transformer department.

Q. Did you have charge of the manufacturing?

A. Yes.

Q. Did you keep any record of transformers manufactured by that Company?

A. Yes.

Q. What did that record show?

A. It showed complete data of every transformer that was manufactured; also when it was manufactured; when it was shipped and to whom it was shipped.

Q. Did you, at some time while you were in charge of the transformer department, make a special transformer which was delivered to the fan department of The Warren Electric & Specialty Company?

A. Yes.

Q. What were the characteristics of that transformer which made it differ from the usual run of transformers, if there were any?

A. The voltage of the secondary side was very low. That is, it was so low it could not be used for any lighting purposes.

Q. For what purposes were the transformers that The Warren Electric & Specialty Company made, that is its general product?

A. For lighting service.

Q. For what service was this special transformer that you referred to?

A. For welding.

Q. For whom was that made?

A. The Pneumatic Wheel Company of Freehold, New Jersey.

Q. Refreshing your recollection from the transformer book, when was that transformer made and shipped to The Pneumatic Wheel Company?

A. (Referring to the transformer book.) It was made and shipped in June 1900.

Q. Have you got the entry, referring to that transformer, in that transformer book?

A. I have.

Q. Will you kindly produce the transformer book?

(Witness produces book.)

Q. Is this (referring to the book which the witness produced) the transformer book you referred to, showing the types and dates

of shipment of all transformers made by The Warren Electric & Specialty Company?

A. Yes.

Q. By whom was this book kept?

A. It was kept originally by H. W. Wiswell, who was at that time the engineer.

Q. Was it kept under your supervision as head of the transformer department?

A. No. You will have to excuse me, I don't remember just when Wiswell left there, but he left some time in 1900. This record here (pointing to entry in the book) will show you, you see he entered this.

Q. How do you happen to have this transformer book of The Warren Electric & Specialty Company in your possession?

A. As being the original record of all transformers manufactured since The Warren Electric & Specialty Company started to make transformers, it was turned over to The Peerless Electric Company when they purchased the transformer business from The Warren Electric & Specialty Company. In 1906 Mr. McBerty and I purchased the transformer business from The Peerless Electric Company, and they in turn turned it over to us.

Q. It is now one of the records of The Enterprise Electric Company?

A. It is now one of the records of The Enterprise Electric Company.

Q. As successor to The Warren Company and The Peerless Company?

A. Yes. That (referring to the transformer book) forms part of a continuous record from the first transformer until the present.

Q. Will you show us the entry of the special transformer that was made for The Pneumatic Wheel Company, about which you have already testified?

A. This one here on pages 30 and 31, which reads as follows: "Serial No. 654, Type C, 2500 wats, primary 250 volts, secondary 2-2.5-3-3.5-4 volts; total primary turns 500, tapped at 222-250-286-333-400 turns; total secondary turns one; size primary wire 12 square B & S; size secondary 8 wires .8 X .1; weight primary wire 27 pounds; weight secondary wire 18 3/4 pounds; weight of iron and copper total 105 pounds; bake number 43; transformer wound June 18, 1900, shipped June 27, 1900 to The Pneumatic Wheel Company, Freehold, New Jersey. Warren Electric & Specialty Company Order No. 20440".

Q. What happened to that transformer after it was shipped to The Pneumatic Wheel Company of Freehold, New Jersey?

A. This transformer was returned to the transformer de-

partment of The Warren Electric & Specialty Company some time between June and December of 1900.

Q. What did you do with it after it was returned?

A. I turned it over to the fan motor department of January 20, 1901.

Q. How do you fix that date?

A. By the record that I have quoted from.

Q. Will you read the memorandum that enables you to fix that date?

A. "Fan motor department 1-20-01".

Q. In whose handwriting is that last entry?

A. Mine.

Q. Is that the date on which you delivered this particular transformer into the fan department of The Warren Electric & Specialty Company?

A. Yes.

Q. Did you make that entry at the time?

A. Yes.

Q. Do you know what that transformer was used for after it was delivered to the fan department?

A. It was used for welding fan guards.

Q. I mean into what machine did it go, did it go into a welding machine?

A. Well, of course, it would have to go into a welding machine if there was to be welding.

Q. What was done with the transformer?

A. It was placed in a machine for welding fan guards.

Q. Was there more than one welding machine in The Warren Electric & Specialty Company at that time?

A. No.

Q. Or at any time, so far as you know?

A. No.

Q. Do you know who built that welding machine, or had it built?

A. No, I do not.

Q. Did you see that welding machine after the transformer was put into it?

A. Yes.

Q. And did that welding machine, with the same transformer, continue in use up to the time The Warren Electric & Specialty Company sold out to The Peerless Electric Company?

A. Yes.

Q. And continued in use by The Peerless Company after the transfer as long as you remained in the employ of The Peerless Company?

A. Yes, so far as I know. They might have discontinued it at some time, but I don't know.

Q. Did the Warren Electric & Specialty Company make any

other transformers of this particular type suitable for welding machines?

A. One.

Q. What was that one?

A. It was a machine of practically the same characteristics as the one I have just mentioned, with ten times the capacity.

Q. For whom was that made?

A. The Pneumatic Wheel Company.

Q. The same concern?

A. The same concern that the first transformer originally went to.

Q. If I understand you correctly, the first one was a small one and was returned for lack of capacity?

A. As I understand it, The Pneumatic Wheel Company were not certain whether they could successfully weld electrically; and my understanding is, they ordered this small machine to demonstrate with, with the understanding that it would be returned in the event of their ordering a larger machine for the same purpose, having enough capacity to do their commercial welding.

(Mr. Stackpole: I object to the answer as being hearsay.)

Q. The first machine, as you understand it, was returned because it was of too small capacity, and you later built another similar machine of larger capacity?

A. Yes.

Q. And those were the only two machines of that type that you built while with The Warren Electric & Specialty Company?

A. Yes.

Q. Will you explain, using the transformer book if necessary, the difference between the transformer which you first sent to The Pneumatic Wheel Company, and the general product of The Warren Electric & Specialty Company?

A. At that time the standard voltage for lighting transformers was 1000-2000 volts primary; and 100-200 volts secondary. This voltage applied to transformers for general lighting purposes.

(Mr. Cushman: The transformer book, testified to by the witness, is offered in evidence, and marked "DEFENDANTS' EXHIBIT 9. TRANSFORMER BOOK OF THE WARREN ELECTRIC & SPECIALTY COMPANY.")

(Mr. Cushman: That is all.)

Direct examination closed.

*Cross-examination by Mr. STACKPOLE:*

Q. This transformer, that was sent to The Pneumatic Wheel Company, was returned and went into the fan department, was a 2 1/2 kilowatt transformer?

A. Yes.

Q. And the secondary gave 2 1/2 volts?

A. Yes.

Q. What was the amperage of it?

A. 1000.

(Mr. Stackpole: That is all.)

Cross-examination closed.

(Signed)

CHAS. B. MCCURDY.

Attest:

(Signed) GEO. T. HECKLINGER,

*Notary Public.*

(Copy)

DISTRICT COURT OF THE UNITED STATES,

DISTRICT OF MASSACHUSETTS.

AMERICAN ELECTRIC WELDING COMPANY &  
THOMSON SPOT WELDER COMPANY, Plaintiffs,  
*vs.*

HOUGHTON & DUTTON COMPANY, Defendant.

EQUITY No. 794.

AMERICAN ELECTRIC WELDING COMPANY &  
THOMSON SPOT WELDER COMPANY, Plaintiffs,  
*vs.*

GEORGE BORGEFELDT & COMPANY, Defendants.

EQUITY No. 795.

AMERICAN ELECTRIC WELDING COMPANY &  
THOMSON SPOT WELDER COMPANY, Plaintiffs,  
*vs.*

S. S. KRESGE Co., Defendant.

EQUITY No. 796.

AMERICAN ELECTRIC WELDING COMPANY &  
THOMSON SPOT WELDER COMPANY, Plaintiffs,  
*vs.*

GRAND UNION TEA COMPANY, Defendant.

EQUITY No. 797.

AMERICAN ELECTRIC WELDING COMPANY &  
THOMSON SPOT WELDER COMPANY, Plaintiffs,  
*vs.*

JORDON-MARSH COMPANY, Defendant.

EQUITY No. 790.

DEPOSITION de bene esse taken in behalf of the defendants  
by agreement and under the statutes of the United States and

Equity Rules at the office of The F. W. Roberts Company, corner of Prospect and East 4th Streets, Cleveland, Cuyahoga County, State of Ohio, beginning at 10 o'clock A. M. October 27, 1917, before John H. Cousins a duly qualified Notary Public in and for Cuyahoga County, State of Ohio.

Appearances: ALAN D. KENYON, Esq., for the Plaintiffs,  
and

ROBERT CUSHMAN, Esq. for defendants Houghton & Dutton Co., George Borgfeldt & Co., S. S. Kresge Co., Grand Union Tea Co., and also appearing for the purposes of this deposition, for the defendants Jordan-Marsh Company.

It is hereby stipulated by and between the parties, by their respective counsel, that this deposition may be taken and used in all the above entitled cases in accordance with and subject to the stipulations entered into at the opening of the depositions taken in said cases at Warren, Ohio, on September 30, 1917, before George T. Hecklinger, Esq., Notary Public.

FRED W. ROBERTS.

FRED W. ROBERTS, a witness called by and on behalf of the defendants, having been duly sworn on oath, deposes and says:

*Direct Examination by MR. CUSHMAN:*

Question. Please state your name, age, residence and occupation.

Answer. F. W. Roberts, 54 years old, printing and stationery business, and I live at Lakewood, Ohio.

Q. With what concern are you connected?

A. The F. W. Roberts Company.

Q. Of Cleveland, Ohio?

A. Yes.

Q. Is The F. W. Roberts Company engaged in the business of printing and stationery?

A. Yes.

Q. How long has that concern been in that business?

A. Thirty-five years.

Q. How long have you been connected with it?

A. Thirty-five years.

Q. Are you the head of that business?

A. Yes.

Q. And have you always been so since the founding of the business?

A. I have.

Q. Did you ever know of the Warren Electric & Specialty Company, of Warren, Ohio?

A. Yes.

Q. Has The F. W. Roberts Company done printing work for them?

A. Yes, sir.

Q. I show you a catalogue of The Warren Electric & Specialty Company, marked "DEFENDANTS' EXHIBIT NO. 2—1901 CATALOGUE OF THE WARREN ELECTRIC & SPECIALTY COMPANY", do you recognize it?

A. I do.

Q. Who printed that catalogue?

A. The F. W. Roberts Company.

Q. Who had personal charge of the negotiations relating to the printing of that catalogue?

A. To the best of my recollection, I did.

Q. What officer or representative of The Warren Electric & Specialty Company did you see about it?

A. Mr. Gillmer, T. H. I think are his initials.

Q. Refreshing your recollection from any records of The F. W. Roberts Company, which you may have, please tell us when the issue of catalogues, like "DEFENDANTS' EXHIBIT 2", was sold to The Warren Electric & Specialty Company.

(Mr. Kenyon: I object, on the ground that no basis has been made to show that the witness is competent to testify on that point.)

A. On or about March 19, 1901.

Q. What was the amount of the bill for this issue of the catalogues?

A. To the best of my recollection it was \$345.55.

Q. And when was that charge paid for?

A. May 10, 1901.

Q. Can you form an estimate at this time as to about how many catalogues that charge would represent?

A. It is a rough guess on my part, but from Three to Five Thousand. There is a change in the values between that time and this. That is the best I can answer it.

Q. Have you the record showing the sale to which you have testified?

A. Only the ledger account.

Q. What other records, or books, were kept at that time beside the ledger?

A. The order would be first made out for the work ticket, and factory and miscellaneous time tickets computed to fill out the original work ticket. When the job was completed the work ticket would be turned into the office to be charged up and a bill made of it, which bill would be copied in the bill book, and entered into the ledger from there.

Q. Are there any of the tickets, bill books, or other records,



which you have mentioned, relating to this sale to The Warren Electric & Specialty Company, now in existence?

A. Not to my knowledge. All tickets and copy books are destroyed or torn up five (5) years after the entry is made, with the exception of the ledger.

Q. Can you produce the ledger referred to, which is the only existing book, as I understand it, covering that time?

A. There it is (indicating a book).

Q. Please read the ledger entries showing the sale of the "Exhibit No. 2" catalogue to The Warren Electric & Specialty Company.

A.

<i>Name &amp; Address</i>	<i>"March 1901 Book"</i>			
	<i>Date</i>	<i>Page</i>	<i>Ck</i>	<i>Debit</i>
Economy Elect. Co. successors to Warren Elect. & Specialty Co. Warren, O."	19	646	E	345.55

Q. Please explain the words "Economy Elect. Co. successors to", which are written over the name "Warren Elect. & Specialty Co. Warren, Ohio", so far as you are able.

A. The entry, as I see it today, looks as if, some time during the life of the ledger, the name "Warren Electric & Specialty Company" was changed to The Economy Electric Company. And "The Economy Elect. Co." appears to be written in in different ink.

Q. Which name appears to be the original entry, from its position on the page and the appearance of the ink, etc.?

A. "The Warren Electric & Specialty Company".

Q. Was this ledger a book kept by The F. W. Roberts Company in the regular course of its business?

A. Yes, sir.

Q. Do you know in whose handwriting these entries, to which you have referred, are?

A. I do not remember.

Q. Was the book kept under your supervision?

A. Yes, sir.

Q. Are the entries true to your best knowledge and belief?

A. Yes, sir.

Q. I note that the entries, which you have quoted from the account of The Warren Electric & Specialty Company, are taken out of the ledger account running from October 1st, 1900 through September 1901. What is your reason for testifying that the charge of March 19, 1901, is a charge for the 1901 catalogue of The Warren Electric & Specialty Co.?

A. The amount that a catalogue of that size, and the quantity usually used by a firm in that line of manufacture, would run into about that amount of money.

Q. Is there any other charge against The Warren Electric & Specialty Company during that whole year which would cover the issue of a catalogue such as this (referring to Defendants' Exhibit No. 2)?

A. There is not. The other items are much smaller.

Q. What do the other items cover, as far as you recall?

A. Miscellaneous printing, and office supplies furnished them.

Q. What does the entry of March 19, 1901 signify in respect to the time when this issue of the catalogue was delivered to The Warren Electric & Specialty Company?

A. The date, within three or four days, of the last shipment of this issue of catalogues to them.

Q. What was the practice of The F. W. Roberts Company in respect to making the ledger entry with reference to the time of the shipment?

A. Charged on our books as soon as the last shipment was made, if it was made in piecemeal.

Q. If it was made all at once, what?

A. It would be the same.

Mr. Cushman: I ask that the ledger, to which the witness has testified, be marked "DEFENDANTS' EXHIBIT NO. 10—THE F. W. ROBERTS COMPANY, 1900-1901 LEDGER"

(Ledger was so marked)

At the request of the witness, it is stipulated that the ledger, "Defendants' Exhibit No. 10 may be left in the possession of the witness, and that the foregoing testimony and transcript of entries may be used in lieu of the book itself, unless the Court, or either of the parties should call for the production of the same on due notice.

Direct examination closed.

*Cross-examination by MR. KENVON (without waiving objections heretofore taken):*

Q. Do you know in whose handwriting these entries are, which have been quoted into the record from the ledger?

A. I do not remember.

Q. They are not in your handwriting?

A. No, sir. They are in the handwriting of one of the staff of bookkeepers.

Q. Are any of the entries on this page (indicating) of the ledger in your handwriting?

A. No, sir.

Q. You stated that the ledger is kept under your supervision. Will you explain what you mean by that?

A. The entire book-keeping system is under my supervision, and the book-keeper is under my immediate directions daily.

Q. I suppose the same is true of all the other departments of your business?

A. Yes, but more particularly the book-keeping, because I am in the office more than I am in the factory.

Q. How often do you supervise your book-keeping in making entries in the ledger?

A. Once a month.

Q. What do you do once a month in this supervision?

A. Go over all the accounts on the ledger.

Q. Do you check up every item of each account, or is it only a general going over?

A. Only a general going over.

Q. You do not attempt to supervise and test the accuracy of every entry in the ledger, or every account in your business?

A. No, sir.

(Mr. Kenyon: In view of the above testimony, the entire deposition of the witness, with reference to the entries in the ledger, or based thereon, is objected to as being immaterial, irrelevant and incompetent, and not the best evidence.)

Q. What is there about this catalogue, Defendant's Exhibit No. 2, that you recognize so that you can testify that it is the work of your firm?

A. The design on the cover was my suggestion to Mr. Gillmer; and I am generally familiar with the different styles of type which we have used in our printing department in past years.

Q. Have you stated all the facts that enable you to recognize it as printing work of your firm?

A. I have a good memory for remembering work that has been done in the house, and particularly that which I personally had to do with; and I am positive that this is work done in our house, as per my testimony.

Q. You have stated one or two facts that enable you to say this was work done by your concern. If there are any others please state them.

A. There is a heading at the top of the pages of "Peerless Fan," of special design, that I was particularly fond of, and it is not a standard type. That is to say, it is a lettering, or drawing, photographed and cuts made of it, that make it different than could be made from any foundry type in general use in printing offices. There is no other thing that I can see about it that would make it more definite than I have already stated.

Q. Does the name of your concern appear on the catalogue anywhere?

A. Not that I can observe.

Q. Did you use this peculiar type "Peerless Fan" in any other catalogue for The Warren Electric & Specialty Company?

A. Not that I remember of.

Q. Did you print other catalogues for them at any other time besides this one before you, "Defendants' Exhibit No. 2"?

A. The work done for The Economy Electric Company, or The Warren Electric & Specialty Company, or The Peerless Electric Company, all of which T. H. Gillmer was the head of, extended over a period of years, too far back to remember the different work done for the companies.

Q. You did other work for The Warren Electric & Specialty Company than this catalogue, "Defendants' Exhibit No. 2," did you?

A. Yes, sir.

Q. Did you do much?

A. We did considerable work for the three companies over a period, I would say, of six or seven years.

Q. From about what time to what time?

A. From about 1900 to 1907 or 1908.

Q. Did you print other catalogues than "Defendant's Exhibit No. 2" for any of these concerns?

A. I think we did, but I have no definite recollection of it.

Q. Did you print a catalogue of 1900 for The Warren Electric & Specialty Company?

A. I do not remember.

Q. Have you no means of ascertaining?

A. I suppose if we checked up our old records we could find out whether we did or not; but we have not done so.

Q. Will you please do so, or have it done?

A. No. I don't want to do it if it is not absolutely necessary. It takes considerable time and trouble and expense, because it takes the time of a man I need for other work.

Q. How did you find the ledger entries you have testified to?

A. Mr. Cushman come in and asked our bookkeeper to check up such entries, which he did, with the results testified to.

Q. What do you mean by "such entries"?

A. He asked if we had printed a catalogue for The Warren Electric & Specialty Company about the period of 1901.

Q. And you found it?

A. And we found the entry, and testified to.

Q. You didn't look up to see whether you printed a catalogue for The Warren Electric & Specialty Company in 1900?

A. No, sir.

Q. Will you please look that up, or have it looked up?

(Mr. Cushman: The question is objected to, on the ground that it is not cross-examination relating to any matter inquired of on direct examination. It already appears in evidence that the record is before counsel, covering the period from October

1st, 1900, to October 1st, 1901, which covers the period pertinent to this inquiry.)

Q. Did you print any catalogue for The Warren Electric & Specialty Company in 1902?

(Mr. Cushman: The same objection.)

A. I do not remember.

Q. Have you looked that up?

A. No, sir.

Q. Please look up, or have it looked up, in your ledger, and see whether you have any entries of the printing of a catalogue for The Warren Electric & Specialty Company in 1900, prior to October, and also in 1902, to see if you printed a catalogue for them in that year.

(Mr. Cushman: The objection is repeated; and it is pointed out that, if counsel for the plaintiffs desires any evidence outside the scope of the Direct Examination, the witness is available to be called as a witness for the plaintiffs.)

A. I have an appointment, and my bookkeeper has an appointment and my appointment is now due, and it cannot be done at this time.

(Mr. Kenyon: I protest against the objections of defendants counsel, and the apparent unwillingness and refusal of the witness to make the search in question, as the same has a direct and material bearing on the direct testimony of the witness already given. And I now ask how long it will take to look these records up, and ask that they be produced later in the day. What time can you have them?)

(The Witness: I am willing to have our book-keeper look it up, although he is about to take a train to leave the city; and I have an engagement in five (5) minutes; and our books are stored away in the basement, very inaccessible and hard to get at.)

Q. What is there on this catalogue, "Defendants' Exhibit No. 2," and on the ledger entries, that you have read into the record, which show that this identical catalogue, "Defendants' Exhibit No. 2," is the one referred to in the ledger entry rather than some other catalogue, or some other publication, that you printed for The Warren Electric & Specialty Company?

A. It is my recollection of printing the catalogue for them, in connection with the amount being about such as would be charged for that amount of work, as I would judge from being in the printing business for the last thirty-five years.

Q. Is there any other reason, and if so, state it, that makes you

think that this catalogue, "Defendants' Exhibit 2," is the identical publication referred to in the ledger entry?

A. No other reason I think of.

Q. What other publications have you made for The Warren Electric & Specialty Company besides catalogues?

A. It is too far back to remember.

Q. Have you any recollection whatever of having printed a catalogue for that Company in 1900?

A. No, sir.

Q. Have you any recollection of having printed a catalogue for them in 1902?

A. No, sir.

Q. Aside from what you have testified about this catalogue, "Defendants' Exhibit 2", have you any independent recollection of having printed a catalogue for that Company in 1901?

A. I have not. And I would further say I would not have of this catalogue if my memory had not been refreshed by it being brought before me, and entries on the books looked up.

Q. If you printed any other catalogues besides "Defendants' Exhibit 2" for The Warren Electric & Specialty Company, can you say, of your own knowledge, that this bill was not for that catalogue rather than for this catalogue here before you, Defendants' Exhibit 2"?

(Mr. Cushman: I object, unless the hypothetical catalogue is identified by time, or the approximate time.)

(Mr. Kenyon: I withdraw the question.)

Q. If you had printed a catalogue for The Warren Electric & Specialty Company for the year 1900, or 1902, could you, of your own knowledge, say that these entries in the ledger, which you have referred to, do not refer to either one of these catalogues, rather than to this catalogue, "Defendants' Exhibit 2"?

A. Not without looking up our records during those years to refresh my memory.

Q. What is there in the printed matter about "Defendants' Exhibit 2" that indicates to your mind the date, that is the year when it was published? I do not refer to any of the written matter on it that has been put on recently, I refer only to the printed matter.

A. Nothing.

Q. So that, if you did at any time print another "Peerless" catalogue for The Warren Electric & Specialty Company about the same six as Defendants' Exhibit 2, the entry in the ledger, so far as you know, would apply equally to such catalogue as to Defendants' Exhibit 2, is that so?

A. If I did, yes.

(Mr. Kenyon: I think that is all.)

Cross-examination closed.

*Re-direct Examination* by MR. CUSHMAN:

Q. Calling your attention to the title page of the catalogue on which is printed "Season of 1901", does that indicate to your mind that the catalogue was not printed in 1902?

A. It certainly does.

Q. Does it also indicate that the catalogue was not printed before October 1st, 1900?

A. I would say so.

Q. Referring to your supervision of the Ledger, Defendants' Exhibit 10, was your supervision such that, if there had been a mistake in the entries, it would have come to your notice?

A. I think so, yes.

Q. Is this ledger, Defendants' Exhibit 10, the book on which The F. W. Roberts Company relies in its dealings with its customers?

A. Entirely.

Q. Has your book-keeper found the ledger of The F. W. Roberts Company for the period preceding Defendants' Exhibit 10, covering the period from September 1, 1898 to September 30, 1900?

A. He has. I find in the ledger from September 1898 to October 1, 1900, one item which could possibly be big enough to cover the issue of a catalogue, and that entry is of November 25, 1899, amounting to \$252.20, which might possibly be a catalogue; but I cannot state positively whether it is or not. My book-keeper has looked up and finds no entries against The Warren Electric & Specialty Company for the year beginning October 1901 to October 1902.

(Mr. Cushman: That is all.)

Re-direct examination closed.

(Signed) FRED W. ROBERTS

—: CERTIFICATE :—

I, John H. Cousins, a Notary Public within and for Cuyahoga County in the State of Ohio, do hereby certify that the foregoing deposition of Fred W. Roberts was taken before me on behalf of the defendants for use in the above entitled cases by agreement on the 27th day of October 1917, at Cleveland, Cuyahoga County, State of Ohio. That said deposition was taken at the office of The F. W. Roberts Company, corner of Prospect Avenue and East 4th Street in said Cleveland. That said witness was by me duly cautioned and sworn before the commencement of his testimony to tell the truth, the whole truth and nothing but the truth. That in accordance with agreement the testimony of said witness was taken

down stenographically by me, and was subsequently by me reduced to typewriting. That the testimony of said witness after it was reduced to writing was read over by him and was signed by him before me. That upon the completion and signing of said deposition it was taken into my custody and is now by me sealed up and addressed to the Court. That the exhibit introduced in evidence during the taking of testimony of the aforesaid witness, duly marked and attested by me, was by agreement of counsel left in the custody of the witness. That I am not of counsel or attorney for any of said parties, nor connected by blood or marriage with any of said parties, nor interested directly or indirectly in the matter or controversy.

IN WITNESS WHEREOF I hereunto set my hand and affix my seal of office at Cleveland, Cuyahoga County, State of Ohio, this 8th day of November, 1917.

(Notarial Seal)

(Signed) JOHN H. COUSINS,  
*Notary Public.*



## IN THE DISTRICT COURT OF THE UNITED STATES,

FOR THE EASTERN DISTRICT OF MICHIGAN,

SOUTHERN DIVISION.

THOMSON SPOT WELDER COMPANY, PLAINTIFF,

vs.

FORD MOTOR COMPANY, DEFENDANT.

IN EQUITY—ON HARMATTA PATENT, No. 1,046,063

Deposition of Howard A. Coombs, taken pursuant to agreement in behalf of the defendant at the Office of Church & Church, 604 McGill Building, Washington, D. C., on the 11th day of April, 1919, before Thomas Durant, a notary public in and for the District of Columbia.

PRESENT: J. L. Stackpole, Esq., in behalf of plaintiff. Melville Church, Esq., in behalf of defendant.

HOWARD A. COOMBS.

HOWARD A. COOMBS, being called as a witness in behalf of the defendant, and duly sworn, deposes and says in answer to questions propounded to him by Mr. Church as follows:

Question 1. Please state your name, age, residence and occupation?

Answer. Howard A. Coombs; age, 46; residence, Washington, D. C.; occupation, patent attorney and expert.

Q. 2. State what your educational advantages and training have been to qualify you to testify as a translator of French and German letters patent for mechanical inventions and particularly inventions relating to the art of electric welding?

A. I graduated in mechanical engineering from the Worcester Polytechnic Institute. For several years preceding my entering the Institute in 1890, I lived in Switzerland where I attended private schools conducted in the French and German languages. I learned to read, understand and speak those languages. After graduating from the Institute in 1893, I worked in various places as an engineer until, in 1896, I was appointed an assistant examiner in the Patent Office, where I remained for over seven years. During the last six of these years I was assigned to one of the metal working divisions and examined applications for inventions for various kinds of machine tools and other metal working machines and processes. For the greater part of the time I had charge of the examination of applications for electric welding and other welding inventions. Since 1903 I have practiced before the Patent Office

and Courts, having my office in Washington, and have made a specialty of foreign search work and translations. I have testified as an expert witness in a considerable number of suits, both as a mechanical expert and as a translator.

A great deal of my time has been given to reading and translating patents and publications on technical matters in the French and German languages, and I am thoroughly familiar, consequently, with technical French and German.

Q. 3. I show you what purports to be a certified copy of German letters patent to Nikolas von Benardos, dated May 8, 1889, No. 50,909, in German, and ask you to state whether or not you have read this patent in the original and understand the structure therein described and shown?

A. Yes, I have read this patent in the original and understand the invention described therein.

Q. 4. I have asked you to prepare a translation of the text of this German patent into English. If you have done so, will you please produce the same?

A. I have made a translation of this patent and now hand you a typewritten copy of said translation.

Q. 5. What have you to say as to the accuracy and faithfulness of this translation?

A. I believe that the translation which I have made of this patent is an accurate and faithful translation of the original German text.

Q. 6. I show you what purports to be a certified copy of French patent to Egel, dated October 13, 1903, No. 335,889, in French, and ask you if you have read and understand said patent and the subject matter therein disclosed.

A. Yes, I have read the patent you mention and fully understand the invention therein disclosed.

Q. 7. I have asked you to make a translation of said Egel patent, No. 335,889, into English. If you have done so will you please produce the same.

A. I have made the translation of this patent and hand you a typewritten copy of my translation in English.

Q. 8. What have you to say as to the accuracy and faithfulness of this translation?

A. I fully believe that my said translation is a faithful and accurate one of the original French text.

Q. 9. I now show you a certified copy of French patent to Egel, of October 13, 1903, No. 336,187, in French, and ask you if you have read and understand said patent and the subject matter therein disclosed.

A. Yes, I have read the patent you mention and fully understand the invention therein disclosed.

Q. 10. I have asked you to make a translation of said Egel patent No. 336,187, into English. If you have done so will you please produce the same?

A. I have made the translation of this patent and hand you a typewritten copy of my translation in English.

Q. 11. What have you to say as to the accuracy and faithfulness of this translation?

A. I fully believe that my said translation is a faithful and accurate one of the original French text.

Q. 12. State whether or not you are interested directly or indirectly in the result of this controversy?

A. No, I am not interested either directly or indirectly in this litigation.

Defendant offers in evidence the following:

Copy of United States Letters Patent to Thomson, No. 347,140, marked "Defendant's Exhibit No. 1".

Copy of United States Letters Patent to Thomson, No. 347,141, marked "Defendant's Exhibit No. 2".

Copy of United States Letters Patent to Benardos and Olezewski, No. 363,320, marked "Defendant's Exhibit No. 3".

Copy of United States Letters Patent to Thomson, No. 396,015, marked "Defendant's Exhibit No. 4".

Copy of United States Letters Patent to Dewey, No. 432,727, marked "Defendant's Exhibit No. 5".

Copy of United States Letters Patent to Coffin, No. 437,571, marked "Defendant's Exhibit No. 6".

Copy of United States Letters Patent to Thomson, No. 444,928, marked "Defendant's Exhibit No. 7".

Copy of United States Letters Patent to Blanchard, No. 466,266, marked "Defendant's Exhibit No. 8".

Copy of United States Letters Patent to Thomson, No. 496,019, marked "Defendant's Exhibit No. 9".

Copy of United States Letters Patent to Lemp, No. 531,197, marked "Defendant's Exhibit No. 10".

Copy of United States Letters Patent to Lemp, No. 553,923, marked "Defendant's Exhibit No. 11".

Copy of United States Letters Patent to Robinson, No. 574,942, marked "Defendant's Exhibit No. 12".

Copy of United States Letters Patent to Kleinschmidt, No. 616,436, marked "Defendant's Exhibit No. 13".

Copy of United States Letters Patent to Burton, No. 647,694, marked "Defendant's Exhibit No. 14".

Copy of United States Letters Patent to Perry, No. 670,808, marked "Defendant's Exhibit No. 15".

Copy of United States Letters Patent to Hunter, No. 690,958, marked "Defendant's Exhibit No. 16".

Copy of United States Letters Patent to de Ferranti, No. 874,398, marked "Defendant's Exhibit No. 17".

Copy of United States Letters Patent to Rietzel, No. 928,701, marked "Defendant's Exhibit No. 18".

Copy of United States Letters Patent to de Ferranti, No. 1,148,221, marked "Defendant's Exhibit No. 19".

Certified copy of British Patent to Parkinson, No. 14,536 of 1894, marked "Defendant's Exhibit No. 20".

Certified copy of British Patent to de Ferranti, No. 11,921 of 1903, marked "Defendant's Exhibit No. 21".

Certified copy of British Patent to Harmatta, No. 22,981 of 1903, marked "Defendant's Exhibit No. 22".

Certified copy of French Patent to Egel, No. 335,889, marked "Defendant's Exhibit No. 23".

Original translation of French Patent to Egel, No. 335,889, marked "Defendant's Exhibit No. 24".

Certified copy of French Patent to Egel, No. 336,187, marked "Defendant's Exhibit No. 25".

Original translation of French Patent to Egel, No. 336,187, marked "Defendant's Exhibit No. 26".

Certified copy of German Patent to Benardos, No. 50,909, marked "Defendant's Exhibit No. 27".

Original translation of German Patent to Benardos, No. 50,909, marked "Defendant's Exhibit No. 28".

Printed copy of application, as filed, of Harmatta Patent No. 1,046,066, marked "Defendant's Exhibit No. 29".

Certified copy of the File Wrapper, Contents and all drawings in the matter of Letters Patent to S. Z. de Ferranti, No. 1,148,221, marked "Defendant's Exhibit No. 30".

Certified copy of File Wrapper, Contents and Drawings in the matter of Pending Application of S. Z. de Ferranti, Serial No. 688,464, marked "Defendant's Exhibit No. 31".

Certified copy of File Wrapper and Contents of Letters Patent No. 1,046,066, to Johann Harmatta, marked "Defendant's Exhibit No. 32".

Certified copy of File Wrapper and Contents of Interference No. 30,709, between application of de Ferranti, Serial No. 688,464, and Patent No. 1,046,066, to Harmatta, marked "Defendant's Exhibit No. 33".

Certified copy of File Wrapper and Contents of Letters Patent No. 928,701, to Adolph F. Rietzel, marked "Defendant's Exhibit No. 34".

Certified copy of File Wrapper and Contents of Interference No. 31,792, between Patent No. 928,701, to Rietzel, and application for Harmatta Patent No. 1,046,066, marked "Defendant's Exhibit No. 35".

Certified copy of Assignment of Application Serial No. 183,677, for Harmatta Patent No. 1,046,066, from Johann Harmatta to Thomson Electric Welding Company, dated February 3, 1912, marked "Defendant's Exhibit No. 36".

Certified copy of Assignment of Application Serial No. 247,081, for Rietzel Patent No. 928,701, from A. F. Rietzel to Thomson Electric Welding Company, of Maine, dated March 23, 1905, marked "Defendant's Exhibit No. 37".

Certified copy of Assignment by Thomson Electric Welding Company, of Maine, of all its assets, to the Thomson Electric

Welding Company, of Massachusetts, dated March 11, 1910, marked "Defendant's Exhibit No. 38".

Certified copy of Assignment of Rietzel Patent No. 928,701 from Thomson Electric Welding Company, of Maine, to Thomson Electric Welding Company, of Massachusetts, dated April 18, 1910, marked "Defendant's Exhibit No. 39".

Certified copy of Assignment of Harmatta Patent No. 1,046,066 and Rietzel Patent No. 928,701, from Thomson Electric Welding Company to Thomson Spot Welder Company, marked "Defendant's Exhibit No. 40".

Certified copy of Assignment dated June 8, 1917, of Application of S. Z. de Ferranti, Serial No. 668,464, from de Ferranti to F. L. Middleton, marked "Defendant's Exhibit No. 41".

Certified copy of Assignment dated July 2, 1917, of Application of S. Z. de Ferranti, Serial No. 668,464, from F. L. Middleton to Melville Church, marked "Defendant's Exhibit No. 42".

Certified copy of Assignment dated July 26, 1917, of Application of S. Z. de Ferranti, Serial No. 668,464, from Melville Church to H. C. Milligan, Trustee, marked "Defendant's Exhibit No. 43".

Original License, dated November 30, 1917, under application of S. Z. de Ferranti, Serial No. 668,464, from H. C. Milligan, Trustee, to Ford Motor Company, marked "Defendant's Exhibit No. 44".

Certified copy of Decree on Mandate, entered in suit of Thomson Electric Welding Company, et al. vs. Barney & Berry, Inc., under Harmatta patent No. 1,046,066, marked "Defendant's Exhibit No. 45".

Certified copy of Record in suit of Thomson Electric Welding Company, et al. vs. National Enameling & Stamping Company, marked "Defendant's Exhibit No. 46".

Certified copy of Original Docket Entries in suit of Thomson Electric Welding Company, et al. vs. United States Metal Products Company, marked "Defendant's Exhibit No. 47".

Copy of Pleadings in suit of Thomson Electric Welding Company, et al. vs. United States Metal Products Company, marked "Defendant's Exhibit No. 48".

Photographs taken by Defendant's Expert, F. L. Dyer, Esq., marked "Defendant's Exhibit No. 49, Dyer Photographs A-1 to A-6".

Photographs taken by Defendant's Expert, F. L. Dyer, Esq., marked "Defendant's Exhibit No. 50, Dyer Photographs B-1 to B-14".

Photographs taken by Defendant's Expert, F. L. Dyer, Esq., marked "Defendant's Exhibit No. 51, Dyer Photographs C-1 to C-8".

Signature and certificate waived.

UNITED STATES DISTRICT COURT,

EASTERN DISTRICT OF MICHIGAN,

SOUTHERN DIVISION.

THOMSON SPOT WELDER COMPANY, PLAINTIFF,

v.

FORD MOTOR COMPANY, DEFENDANT.

IN EQUITY—ON HARMATTA PATENT, No. 1,046,066.

Deposition of WILLIAM FRIESS, a witness produced in behalf of the defendant, taken at the office of Messrs, Church & Church, 908 G Street, N.W., Washington, D. C., on the 9th day of May, 1919, before Thomas Durant, a notary public in and for the District of Columbia, pursuant to agreement.

PRESENT: J. L. Stackpole, Esq., for the plaintiff. Melville Church, Esq., for the defendant.

WILLIAM FRIESS.

WILLIAM FRIESS, being duly sworn, deposes and says as follows, in answer to questions put to him by Melville Church, Esq., of counsel for defendant:

Question 1. Please state your name, age, residence and occupation?

Answer. William Friess; age, thirty-eight years; residence, Clarendon, Virginia; occupation, clerk in the United States Patent Office.

Q. 2. How long have you been employed in the Patent Office.

A. Since June 23, 1898.

Q. 3. And in what department of the Patent Office are you at present employed?

A. The Docket Clerk's Room.

Q. 5. What character of work is handled in the Docket Clerk's Room?

A. We have charge of all printed testimony, original testimony, briefs and exhibits filed in contested cases; also set hearings before all of the tribunals of the Patent Office and send notices to the Court of Appeals of hearings in interference cases.

Q. 6. Are you familiar with the course of proceedings in the prosecution of applications for patents that are not involved in, or before they are involved in, contested proceedings with rival claimants?

A. I am.

Q. 7. Are you familiar with the practice of the Patent Office under Rule 75 in regard to the showing that is necessary to be made by an applicant whose application is rejected upon a foreign or domestic patent that shows but does not claim that he is claiming?

A. I am.

Q. 8. Where physical exhibits accompany affidavits filed under Rule 75, in whose custody are they primarily placed?

A. The physical exhibits, if any, are first given into the custody of the model custodian, Mr. Gill, and by him are delivered to the Primary Examiner having charge of the application in question.

Q. 9. In an application filed by Adolph F. Rietzel, on the 24th day of February, 1905, which resulted in patent No. 928,701, dated July 20, 1909, two affidavits appear to have been filed by the applicant under Rule 75, one verified October 23, 1908, and the other verified February 18, 1909. In the affidavit verified October 23, 1908, reference is made to a physical exhibit marked "Specimen of Pulley, C. F. Tischner, Jr., Notary Public". I have asked you to make search for this specimen of pulley. Please state whether or not you have found it?

A. I find attached to the affidavit of Rietzel, executed October 23, 1908, what appears to be a part of a metal pulley bearing a tag attached thereto marked, "Specimen of Pulley, C. F. Tischner, Jr., Notary Public", on one side, and on the other side, "Application of A. F. Rietzel, Metal Working, Filed February 24, 1905, S. N. 247,081", and bearing the Patent Office Stamp "November 30, 1908".

Q. 10. Will you give a little more particular description of this pulley?

A. It appears to be a part which is about one inch in diameter that is apparently struck up from a steel or iron plate so as to form what may be called a rim and hub portion. On the hub portion there appear to be projecting in the direction of the axis of the hub at intervals five raised portions or projections.

Q. 11. The affidavit of Rietzel, verified February 18, 1909, and filed March 13, 1909, also refers to certain exhibits, to-wit: "accompanying pieces of work marked, 'Specimen No. 1, D. M. Edsall, N.P.' and 'Specimen No. 2, D. M. Edsall, N.P.'; also pointed electrode the same in form as the accompanying electrode marked for identification, 'Welding Electrode, D. M. Edsall, N.P.'." Are these exhibits referred to now attached to the affidavit of Rietzel?

A. They are not.

Q. 12. Have you made search for them among the records of the Patent Office and in all likely places where such exhibits might be found, and if you have will you state what you have done in that connection?



A. I have made a thorough search for those exhibits and have been unable to locate them.

I find in the Rietzel file a letter dated March 12, 1909, addressed to the Commissioner of Patents, stating that,

"We are sending you by Adams Express the specimens referred to in the affidavit of Adolph F. Rietzel, dated February 18, 1909 and filed with an amendment in the above case, dated March 3, 1909."

Indorsed upon this letter in red pencil there is the notation, "3 models to Mr. Gill, A.D.C.", which indicates that the specimens were in due course sent to the model custodian, Mr. Gill, by Mr. A. D. Cutts, the clerk then employed in the mail and express division. I find upon examination of a book kept by Mr. Gill that the receipt of the models by him was noted and an entry made indicating that they were forwarded in due course to the Primary Examiner in Division 3 having charge of the application. Following this clue, I went to the Examiners room in Division 3 and inquired of the Examiner and of his Assistants if those specimens were still in that division, or if they knew what had become of them. They made examination and reported that the specimens were not in the division. I then personally made an exhaustive search in the division and in all other likely places where such specimens might have been placed, but was unable to locate them. My belief is that they have become lost. From the description given of the specimens it was apparently impracticable to keep them attached to the papers in the file of the case and they were, being detached, probably mislaid and have become lost. At least a most diligent search on my part has resulted in a failure to find them.

Not only did I make inquiry of the Examiner and his Assistants in Division 3 to which this Rietzel case was assigned, but I personally examined the desks of the Examiner and of his Assistants and the cupboards and other places in the division, where such specimens would likely be placed, with no success. I not only made an examination in Division 3 to which these specimens were sent, but I also made a similar examination in Divisions 37 and 26, thinking that possibly the specimens might have been sent to either of these divisions. I also examined the records in the Docket Division and the models and exhibits filed in connection with contested cases and was unable to locate the specimens there. I know of no likely place in the Patent Office where these specimens might be found that I have not searched. I am, therefore, quite certain that these specimens are not now in the Patent Office.

I might add that from time to time sales are made of old models and parts that have been filed as specimens and exhibits in contested and uncontested cases, and it is quite possible that these particular specimens about which you inquire, being detached, were disposed of at one of these sales.

Certificate waived.